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The AUTOMOBILE

Germany's Export Trade

An Analysis Revealing Opportunities—How the 1912 Foreign Business of $30,000,000 Was Distributed

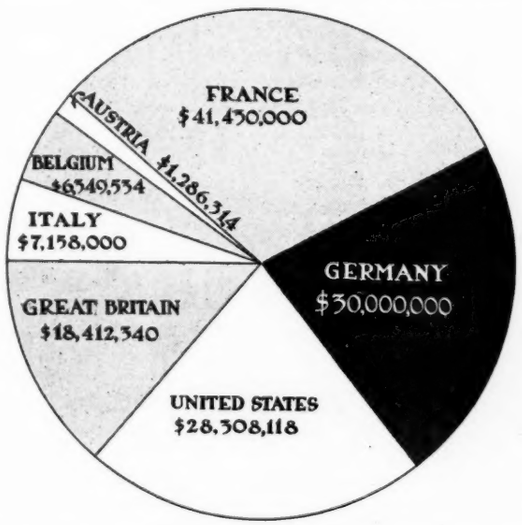
By Marc Braun

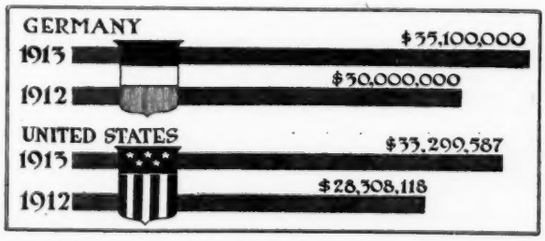
THAT Germany's exports of automobiles, motor trucks, parts, etc., for 1913 totaled $35,000,000 in value, or more than those of the United States for that year, will be news to a good part of the American automobile and allied industries. Exports of the United States covering these lines amounted to $33,299,587 in 1913, while for 1912 the statistics gave Germany's shipments a value of $30,000,000, as compared with $28,308,118 for those of the United States. Detailed information is not as yet available for 1913, but the 1912 statistics in themselves tell a story of the greatest interest to the automobile, commercial vehicle and accessory manufacturers of the United States, disclosing as they do the tremendous extent of their German competitors' influence throughout the world. In other words, owing to the war in Europe, the great markets which Germany has heretofore supplied would seem to be open to our enterprise. But let us see what an analysis of the 1912 exports of German makers reveals.

An Analysis

According to reports in the annual year book of German statistics, monthly bulletins and other official documents, information is available on German automobile exports to practically all the countries of the world except Austria, Italy, Turkey, Greece, Servia, Bulgaria and Roumania. Of these, however, the only ones of any importance are Austria and Italy.

Germany's shipments to the other nations of the globe totaled $25,078,118 for the year 1912. This figure includes automobiles, motor trucks, parts for both classes of vehicles and motorcycles. The countries to which the $25,078,118 worth of automobiles, trucks and allied products were shipped are: All of Europe except the seven countries named, all of Asia, Africa, Australasia, Mexico, Central and South America, the United States and Canada.





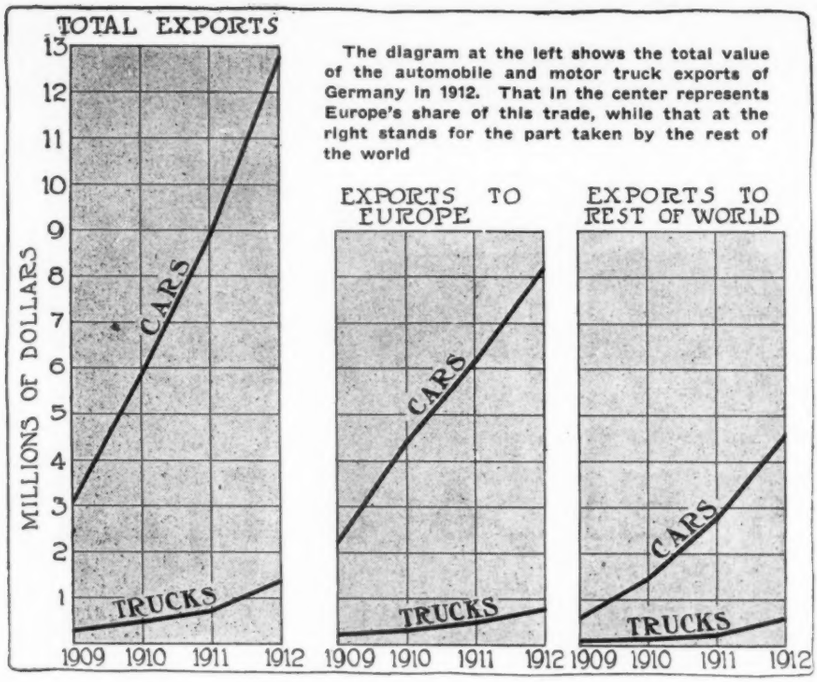
Above—Diagram showing relative value of automobile exports of the various nations. France leads with Germany second and United States third.

Below—A comparison of the export trade of Germany and the United States for 1912 and 1913

Europe's Share Largest

Naturally, the bulk of Germany's exports went to European countries, the total value of Europe's share being $15,945,834 in 1912, as compared with $8,470,950 for the rest of the world, except the seven countries named and the United States and Canada, the total exports of Germany to the two last mentioned for 1912 being $258,250.

An idea of the importance attained by the German automobile and motor truck export industry may be gained from a comparison of the total values of cars, trucks, etc., shipped by other countries in 1912. An inspection of the chart on this page brings out clearly the fact that the world's export business in 1912 might be considered as divided into four parts, France, Germany and the United



The diagram at the left shows the total value of the automobile and motor truck exports of Germany in 1912. That in the center represents Europe's share of this trade, while that at the right stands for the part taken by the rest of the world

States each taking one and the rest of the countries, Great Britain, Italy, Belgium and Austria all together constituting the fourth.

France the Leader

France in 1912 was the great leader in motor car exports, her total figures for the year being $41,430,000. A further analysis of these figures show that of this total of French exports England took 27 per cent., Belgium 22 per cent., Algiers 7.8 per cent., Germany 7 per cent., Argentina 6.26 per cent., Brazil 5 per cent., Spain 2.4 per cent., United States 2.4 per cent., Switzerland 2.2 per cent., Italy 1.3 per cent. and Russia 1.2 per cent.

Britain Supplies Colonies

During the same year Great Britain exported motor cars and parts to the value of $18,412,340. Great Britain's exports are largely to her own colonies or possessions. Thus, in 1912, of her total automobile exports of $18,412,340 more than one-half went to her possessions, the exact figure being $10,765,500, as compared with a total export business on cars and parts to foreign countries of $8,397,970.

Belgium exported $6,349,534 worth of automobile products, her greatest consumers being Great Britain, Germany, France and Argentina, in the order named.

Italy's 1912 exports amounted to $7,158,000. Austria exported passenger cars and trucks to a total value of $1,286,314.

Returning again to the German industry: The information concerning automobile parts not being available for 1911, 1910 and 1909, we will deal principally with the motor car and motorcycle business only.

The Yearly Increase

Figures tell the story better than explanations. While in 1909 the German export trades in passenger vehicles represented a total value of $3,095,375, this increased to $5,859,350 in 1910, to $8,848,500 in 1911, and reached a total of $12,789,550 in 1912.

Just as rapid was the increase in the commercial vehicle export business which totaled $301,500 in 1909, grew to $463,666 in 1910, rached $720,500 in 1911, and was almost one and one-half millions in 1912, the total being $1,405,734.

Motorcycles to a total value of $292,250 were exported in 1909, while the following year the exports dropped to $254,250. In 1911 the exports again increased, totaling $320,750, and in 1912 this total amounted to $471,250.

6,331 Vehicles in 1912

All told, the German manufacturers exported 6,331 passenger vehicles and chassis in 1912—not including the countries referred to above. The total value of these cars was $12,789,550 and the average price per car or chassis was $2,020.

The total number of commercial vehicles exported was 502, valued at $1,395,734 or an average of $2,780 each.

There were exported 2,352 motorcycles valued at $471,250, or $200 each.

Average Car Values

The average value of the passenger cars exported into European countries was $1,924 and of those exported outside of Europe $2,025.

The total value of the automobile parts exported by Germany in 1912 was $10,411,584 and it will be seen from the detailed statistics that fully 65 per cent. of the total represents automobile tires and inner tubes. Next in importance are motors and engines for automobiles and other vehicles.

Russia, the Big Buyer

Germany's best customer in Europe in recent years has been Russia, which purchased 1,120 passenger vehicles and 143 commercial vehicles in 1912, representing a total value of $3,152,500. The average price of the passenger car was $2,382 and of the commercial vehicle $3,386. The total increase of business over 1911 was a trifle over $1,000,000 and only a little less than $2,000,000 as compared with 1910, while in comparison with 1909 the increase was nearly $2,500,000.

Great Britain Second Buyer

The next best customer was Great Britain, which bought 1,072 passenger cars and twenty-four commercial vehicles or all told 1,096 of a total value of $1,886,750, which was an increase of less than $400,000 over the business of 1911. Including parts and motorcycles the total business of Germany with Great Britain in 1912 amounted to over $4,500,000.

France Slow on German Cars

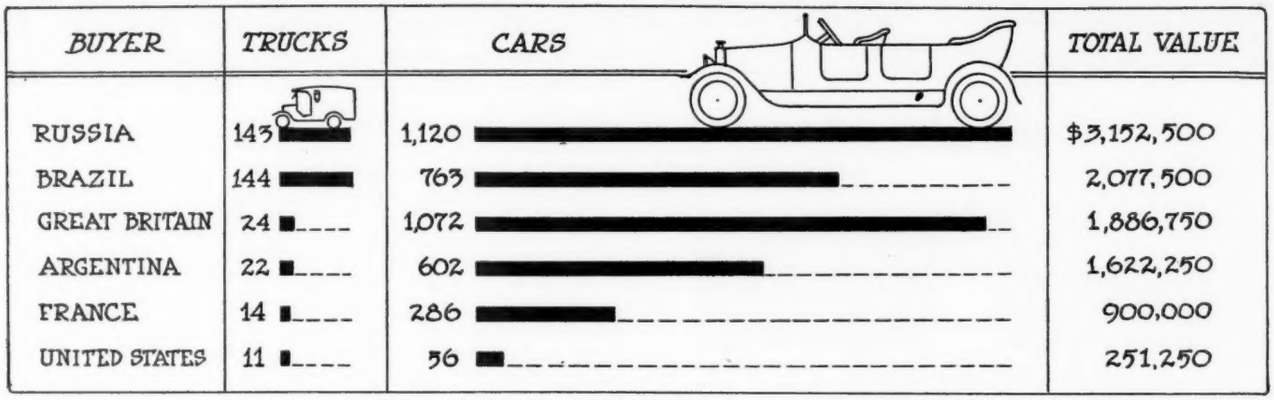
France imported only 300 German cars of which fourteen were commercial vehicles. The total value was about $900,000, but with parts and motorcycles the total was more than $3,000,000.

France was Germany's second best customer for automobile tires, its purchases totaling $2,123,750, which was about $450,000 less than the British purchased of German tires in 1912.

Our German Imports

According to the government statements only fifty-six motor cars worth $220,750 were shipped to the United States in 1912 and their average value was $3,718, while the average value of the eleven commercial vehicles, worth $30,500 in all, exported to the United States was $2,772. Only thirteen motorcycles came to this country from Germany and their price was $211 each.

According to the German records the total value of the German cars, motorcycles and parts exported to the United



Chief buyers from Germany—A graphic representation of the number of cars and trucks and the total value in each case bought by the different leading countries from Germany in 1912. Russia, strange to relate, was the best customer, with Brazil second, Great Britain third, followed in order by Argentina, France and the United States

States was: $331,500 in 1909; $321,500 in 1910; $549,750 in 1911; and only $263,000 in 1912. This tremendous decrease of German imports into the United States in 1912 as compared with the amount purchased from the Empire in 1911, is a significant indication of the increasing influence of the American manufacturers.

In 1911 the German pleasure vehicles imported into this country represented a total value of $497,250. In 1910 the imported pleasure vehicles were valued at $265,250, and in 1909 their value was $271,000. In that year the imported commercial vehicles represented a value of $2,750, which increased to $17,500 in 1910, and to $23,500 in 1911.

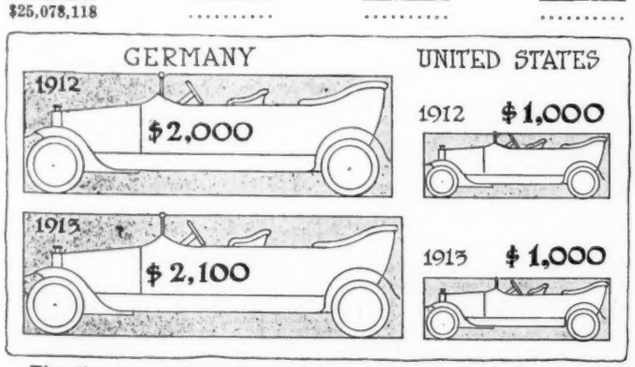
Small Canadian Business

The German business with Canada amounted to very little, totaling $18,250 in 1912, of which $14,000 represents automobile tires, $4,000 the value of two passenger vehicles and $250 the value of one motorcycle.

Quadruples in 4 Years

A table showing the grand total of German export trade of automobiles, parts, accessories and motorcycles with the most important countries in the world:

1912	1911	1910	1909
	PASSENGER CARS		
$12,789,550	$8,848,500	$5,859,350	$3,095,375
	COMMERCIAL VEHICLES		
1,405,734	720,500	463,666	301,500
	MOTORCYCLES		
471,250	320,750	254,250	292,250
$14,666,534	$9,889,750	$6,577,266	$3,689,125
	PARTS		
10,411,584	.....	.....	.....
$25,078,118	.....	.....	.....



The diagram at the left represents the average value per vehicle exported by Germany in 1912 and 1913, while at the right is a similar illustration of the average value per vehicle for United States exports. The figures include both passenger cars and trucks

An analysis of this tabulation shows that this export trade has almost quadrupled in 4 years, growing from $3,000,000 in 1909 to $12,500,000 in 1912 in passenger vehicles alone. In commercial cars her exports have increased five fold in these 4 years.

Trade with Europe

The total value of the German export trade of automobiles, parts, accessories and motorcycles from 1909 to 1912 to countries in Europe only is shown in the following tabulation:

1912	1911	1910	1909
	PASSENGER CARS		
$8,175,850	$6,045,500	$4,392,700	$2,476,475
	COMMERCIAL VEHICLES		
804,984	482,000	310,750	234,000
	MOTORCYCLES		
390,250	262,000	196,000	204,250
$9,371,084	$6,789,500	$4,899,450	$2,914,725
	PARTS		
6,574,750	.....	.....	.....
$15,945,834	.....	.....	.....

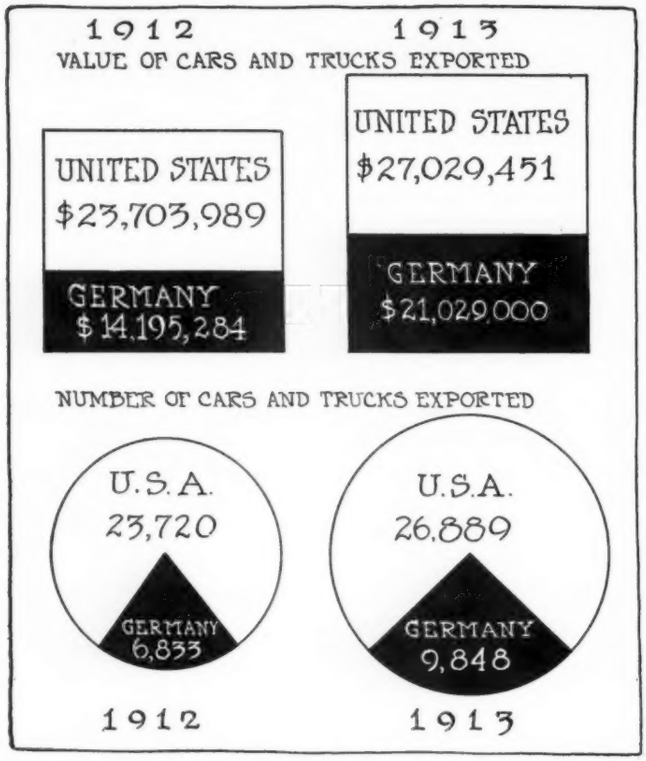
An inspection of the figures will reveal a story of greatly increased business, as the passenger car exports have more than tripled in the 4 years referred to; the truck business has similarly grown; and the motorcycle business has shown material gains. This condition of growth of exports is not local to Germany but applies to practically all European countries building cars except Austria and is largely due to the rapid development of the industry.

Business Outside Europe

To supplement the foregoing tabulation, the following statistics give the total value of German export trade in passenger cars, commercial vehicles and motorcycles to countries not in Europe, except the United States and Canada:

1912	1911	1910	1909
	PASSENGER CARS		
$4,389,950	$2,305,750	$1,201,400	$347,900
	COMMERCIAL VEHICLES		
560,250	215,000	135,416	64,750
	MOTORCYCLES		
78,000	48,500	37,000	55,250
$5,028,200	$2,569,250	$1,373,816	$467,900
	PARTS		
3,412,750	.....	.....	.....
$8,470,950	.....	.....	.....

These figures aid those already quoted in bringing out the fact that the bulk of Germany's export trade is taken by



The upper diagrams represent a comparison of the total value of cars and trucks exported by Germany and the United States in 1912 and 1913 and the two lower charts contrast the number of vehicles exported by each of the two countries in these years. Note the greater number and lower average price of the American cars and trucks

European countries, but it must not be overlooked that German makers have extended their business into every quarter of the globe and have developed in a few years an export business of over $8,000,000 in countries outside Europe, the United States and Canada.

Exports, to South America, Africa, Asia, Australasia,

During 1912 Germany exported all told 2,241 automobiles valued at $5,028,200 to countries outside of Europe. The export trade in motor cars of the United States during that same year and to those same countries totaled 8,400 cars valued at $8,416,095 or an increase over the German business of nearly $3,500,000.

Americans Gain

Compared with 1911 the increase in business on the American side had been a little over $3,400,000 while on the German side the total showed an increase of only $2,500,000. The proportion of the increase of business is even greater for the American manufacturers for 1911 as compared with 1910, the total difference being $2,600,000 in favor of the United States and only $1,200,000 for the German manufacturers.

Comparing the German to the French export trade in 1912 to all countries outside of Europe, except the United States and Canada, and including parts, accessories and motorcycles, the official government records show that the value of the German exports totaled $8,470,950 while the total to the credit of the French manufacturers was $13,374,659 or nearly $5,000,000 more.

All the figures given in the charts or tables were taken from official German consular reports or from other official source. While the details for each country are available only for the year 1912 the totals are given for the years 1909 to 1911, and the data will give a fairly good idea of the rapid growth of the German automobile business with foreign countries which are now looking principally to the United States to supply them with these goods and others.

$2,000,000 Increase in 1 Year

Briefly stated, Germany exported $4,389,950 worth of passenger cars to South America, Asia, Australasia, Africa and Mexico during 1912, while the trade with those same countries in 1911 amounted to only $2,305,750, or a difference of over $2,000,000. In 1910 the total value of Germany's export business to all countries, excepting Europe, amounted to $1,201,400 for its passenger cars, which represented an increase of over $850,000 over 1909.

Truck Exports Double

The exports of commercial motor vehicles has followed about the same increase, its value in 1909 being only $64,750 while the following year it more than doubled, totaling $135,416. In 1911 the total was $215,000 and in 1912 it had increased to $560,250.

The motorcycle business has not followed the same ascending trend, for while in 1909 $55,250 worth of the little two-wheelers were exported, there was a sharp decline in 1910 when the exports showed a total value of only $37,000. The following year a gain of $11,500 was made, the total value being $48,500. In 1912 the German manufacturers had their banner year as they exported $78,000 worth of motorcycles outside of Europe.

$3,442,750 in Parts

For 1909, 1910 and 1911 the information for parts exported is not at hand, but for 1912 it totals $3,442,750 of which fully three-quarters represent tires and inner tubes.

$2,150 Per Car

All told, it appears from the records of the German government that only 2,241 passenger cars were exported outside of Europe in 1912 and their average value was $2,150. According to the detailed statistics per country the average value of the cars often varied, taking each country separately. Thus, for instance, the average value of the 763 passenger cars imported into Brazil was $2,183 while the average price of the 602 imported into Argentina was $2,582 or $399 more per car than those which went to Brazil. On the other hand, the average price of the thirty-six cars which were shipped to Japan was $1,660 or $523 less than those which went to

Analysis of German Passenger Car Exports in 1912

Passenger Cars and Chassis	No.	Value	Average Value per Unit
Exported	6,331	$12,789,550	$2 020
Sold in Europe	4,248	8,175,850	1,924
Sold outside Europe	2,025	4,389,950	2,167
Sold in U. S.	56	220,750	2,718

Analysis of German Commercial Vehicle Exports in 1912

Commercial Vehicles	No.	Value	Average Value per Unit
Exported	502	$1,395,734	$2,780
Sold in Europe	291	804,944	2,766
Sold outside Europe	200	560,250	2,901
Sold in U. S.	11	30,500	2,772

Brazil and over $900 less than those which were imported into Argentina. This is an interesting point as showing the trend of business in the different countries.

Trucks Average $2,801

The average price of the 200 commercial cars exported in 1912 was $2,801. The variance in average price per country was as marked as for the passenger vehicles. For instance those which went to Brazil averaged $2,858, those which were shipped to British Malaysia averaged $3,833 and those which went to Australasia averaged $2,125.

The average value of the 384 motorcycles exported was $203. The ninety-seven which went to Brazil averaged $219; the nine shipped to Mexico averaged only $166, while the twenty-seven purchased by Siam averaged $120.

A Steady Increase

The South American countries were Germany's best customers. The business in pleasure and commercial motor cars with Brazil totaled only $83,750 in 1909. One year later its total was $424,250. In 1910 it had come near the million dollar mark, totaling $826,750 and in 1912 it had passed the two million mark, the total being $2,077,500. The German trade with Argentina was about just as steadily on the increase, being only $82,500 in 1909 while in 1912 the total was $1,622,250.

2,801 Cars for Argentina in 4 Years

The German consular reports for the 4 years from 1904 to 1908 show that during that period a total of 2,801 automobiles were imported into Argentina and that 1,772 came from France, 348 from Germany, 236 from the United States, 216 from Great Britain, 180 from Italy, thirty-one from Belgium and nineteen from Spain.

During 1910 there were imported 1,610 cars, during 1911 the total was 2,473 and this reached 4,013 in 1912. About 39 per cent. of the cars came from France, about 25 per cent. from Germany, about 16 per cent. from the United States and about 13 per cent. from Italy.

The average value of the passenger cars imported by Argentina in 1912 was $2,582, while the trucks averaged $3,070. Motorcycles averaged $219.

Argentina's Growing Demand

The statistics representing automobile exports from all countries into Argentina in 1909, 1910, 1911 and 1912 are:

	1912	1911	1910	1909
	PASSENGER CARS			
602	$1,554,750	$619,000	$259,000	$80,000
	COMMERCIAL VEHICLES			
22	67,500	19,000	10,000	2,500
624	$1,622,250	$638,000	$269,000	$82,500
	PARTS			
...	*$853,000	....	.. ..	.....
	MOTORCYCLES			
41	$9,000	$14,750	$6,000	$6,500

*Includes automobile tire covers and tubes for $601,500.

One-Third of Brazil's Imports Are German

The imports of motor cars into Brazil increased from 735, valued at $1,123,400 in 1910, to 1,574, valued at $2,293,700, in 1911, and to 3,785 of a total value of $5,368,000, in 1912. The average value per car for those 3 years was respectively $1,528, $1,457 and $1,418. One-third of the imported cars in 1912 came from Germany and one-fifth from the United States, while in 1911 the proportion was one-fifth for both countries. In 1910 the proportion was one-fourth from Ger-

(*Continued on page* 1047)

Automobiles, Motor Trucks, Frames, Motors, Parts, Tires and Motorcycles Exported by Germany for the Year 1912.

Country	Number of Cars	Total Value	Number of Trucks	Total Value	Parts, Value	Frames, Value	Motors, Value	Tires and Tubes, Value	Motor Cycles, No.	Value
Algeria	2	$3,750	1	$750	.....	.....	.....	.....	.....	.....
Argentina	602	1,554,750	22	67,500	$256,500	.....	.....	$601,500	41	$9,000
Australasia	117	186,000	4	8,500	149,250	.....	.....	663,250	54	11,250
Belgium	316	424,350	19	42,484	.....	.....	.....	.....	.....	.....
Brazil	763	1,666,000	144	411,500	132,500	.....	.....	216,750	97	21,250
British India	48	83,250	.....	.....	136,250	.....	.....	176,250	22	4,000
British Malaysia	10	13,750	3	11,500	17,250	.....	.....	110,250	2	500
British East Africa	1	2,000	.....	.....	.....	.....	.....	.....	2	500
British West Africa	.....	.....	.....	.....	5,500	.....	.....	.....	.....	.....
British South Africa	33	47,250	2	3,250	.....	.....	.....	137,500	58	9,500
Canada	2	4,000	.....	.....	.....	.....	.....	14,000	1	250
Ceylon	12	33,500	.....	.....	2,000	.....	.....	17,000	.....	.....
Chili	44	71,250	1	4,000	5,250	.....	.....	13,500	14	5,500
China	15	22,750	.....	.....	16,000	.....	.....	38,250	1	250
Colombia	1	1,250	.....	.....	.....	.....	.....	.....	.....	.....
Cuba	5	15,500	.....	.....	41,500	.....	.....	.....	3	250
Denmark	298	381,250	10	22,250	.....	.....	.....	252,500	503	106,750
Dutch India	191	307,500	2	3,750	60,750	.....	.....	174,750	15	2,750
Egypt	4	10,750	1	2,250	40,000	.....	.....	32,000	.....	.....
Finland	121	268,500	35	73,500	.....	.....	$5,000	19,500	66	13,750
France	286	878,000	14	15,500	.....	$500	11,500	2,123,750	76	14,000
French Indo-China	.....	.....	.....	.....	500	.....	.....	13,750	.....	.....
German African Posses.	8	14,750	1	2,750	.....	.....	.....	.....	22	4,000
Holland	511	729,000	11	22,500	.....	1,250	18,000	405,500	134	24,750
Jamaica	3	6,000	.....	.....	.....	.....	.....	.....	.....	.....
Japan	36	59,750	3	7,000	144,250	.....	.....	4,500	16	2,750
Kiao-Chow	5	10,250	.....	.....	3,000	.....	.....	.....	3	500
Mexico	24	61,000	.....	.....	16,250	.....	.....	25,000	9	1,500
New Zealand	8	15,250	2	5,250	650	.....	.....	108,850	1	250
Norway	59	108,500	13	28,250	.....	.....	1,500	25,000	.....	.....
Paraguay	1	4,000	.....	.....	.....	.....	.....	.....	.....	.....
Peru	1	1,500	.....	.....	.....	.....	.....	.....	.....	.....
Persia	1	2,500	.....	.....	.....	.....	.....	.....	.....	.....
Portugal	59	138,000	4	13,000	14,250	.....	.....	54,500	138	24,250
Portuguese E. Africa	2	3,000	.....	.....	500	.....	.....	.....	.....	.....
Portuguese W. Africa	2	3,500	.....	.....	1,250	.....	.....	.....	.....	.....
Russia	1,120	2,668,250	143	484,250	.....	3,750	48,500	549,000	577	114,250
Siam	31	45,750	9	19,000	6,500	.....	.....	.....	27	3,250
Spain	84	183,500	2	5,250	.....	.....	4,750	189,250	7	2,000
Sweden	201	354,000	.....	.....	.....	2,000	4,250	191,000	135	31,250
Switzerland	121	218,000	16	35,750	.....	1,250	41,750	.....	104	19,000
Tunis	.....	.....	.....	.....	19,500	.....	.....	.....	.....	.....
United Kingdom	1,072	1,824,500	24	62,250	.....	.....	40,500	2,566,000	214	40,250
United States	56	220,750	11	30,500	.....	.....	7,000	2,000	13	2,750
Uruguay	71	190,000	3	6,000	54,500	.....	.....	.....	14	4,000
Venezuela	1	3,250	.....	.....	.....	.....	.....	.....	.....	.....
Total	6,348	$12,786,350	500	$1,388,484	$1,123,900	$8,750	$182,750	$8,725,100	2,369	$474,250

NOTE.—No statistics were available on German exports of automobiles, trucks, etc., to Austria-Hungary, Italy, Greece, Turkey, Roumania, Servia and Bulgaria.

Fashion Hints for Winter Wear

Part II

NOWADAYS very few ladies who drive their own cars, or are used to the pleasure and convenience of riding about in them, let the weather conditions interfere with their frequent excursions into the realm of the open air. In a recent issue THE AUTOMOBILE reviewed and described the most up-to-date and most comfortable garments offered for the winter season for the masculine automobilist; herewith are similarly treated the latest dictates of Dame Fashion for the motoring lady who loves the snappy, zestful air of winter and the feel of the frozen road as the silent tires sweep the purring car briskly along.

A glance at the varied styles illustrated gives an idea of how carefully the supply companies have prepared for the winter trade. Almost every imaginable type of garment and accessory has been designed and manufactured for winter wear and great attention is given to include in the make-up of each article the qualities of comfort and stylish appearance. But look at the illustrations and you will recognize all these little features without further comment being necessary.

Ladies' raccoon coat finished with silk or blanket linings and designed to be at the same time comfortable, warm and becoming in appearance. While this is a midwinter type of garment, it will not be found too warm for the late fall and early spring. Auto Supply Co., $125 to $300. The silk-lined short gloves illustrated sell at $6.

Cloth hat with velvet band. This shape presents a number of possibilities in the way of trimming and is sold either with or without plume. The hat will always be attractive and stylish. Smith-Haines, with plume, $7.50. Without plume, $5.

Above—An Angora wool muffler which is furnished in all colors and combinations. These mufflers are soft and warm, and are made long enough to prevent slipping loose, as may be seen. Auto Supply Co., $2.50 to $6.50. The velour hat illustrated is $10.

At the left—Retaino bonnet for ladies. The close-fitting shape prevents it from blowing off and its simplicity insures attractive appearance. The use of the bonnet with a veil is illustrated. Lowe Motor Supplies Co., $4.

Above—Automobile coat which comes in soft worsteds in all colors and combinations. The collar is convertible and the belt is an added feature of completeness in design. Auto Supply Co., $35 to $52.50. The velvet cap in all colors is $2.50 to $5.

Above — Another adaptation of the Retaino bonnet and a veil. This bonnet is slightly different in shape, material and construction from that illustrated on the opposite page and is a little lower in price. Lowe Motor Supplies Co., $4.

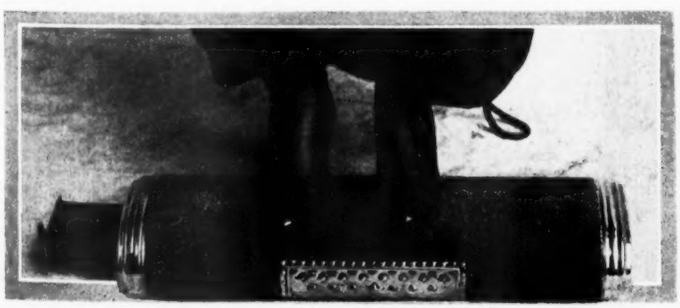
A silk-lined coat with Australian opossum collar and well-designed set-in sleeves. The illustration gives an excellent idea of the becoming appearance of the garment, which is warm and cosy. Auto Supply Co., $40 to $55. The hat is the same as that shown at the left of the page.

Above — Bedford cord robe for keeping the driver or passengers warm and cosy on a wintry day. The robe is made in all sizes and colors and is surprisingly light to carry, especially in view of its warmth-giving qualities. Auto Supply Co., $15 to $47.50. The cushion shown open is described at the bottom of the page.

Squirrel-lined coat with black fox collar. The coat material is black broadcloth. This is a very elegant, comfortable and becoming coat. It may be had in other material and different furs if desired. Auto Supply Co., $75 to $1.50. The green plush hat is $5 to $7.50.

Combination coat for wear in either street or car with large set-in sleeves and convertible collar. The material is worsted. Auto Supply Co., $30 to $50. The velour hat sells for $5 to $7.50.

Leather cushion with pockets, shown open at the top of the page, for carrying veils, gloves, toilet articles, etc. This is a very useful article, especially for touring. The Retaino bonnet is illustrated on the opposite page. The cushion has handles for carrying it. Auto Supply Co., $6.50.



At the left is illustrated a charcoal foot warmer which comes in blue, maroon, black and gray, and in sizes from 12 to 24 inches length. The fuel drawer is pulled out at the left. Trimmings are nickel. Auto Supply Co., $2 to $10. The one illustrated is $10.

Left—Goggles with ball and socket joint over nose, allowing folding. The lenses are removable and interchangeable. There is provision for ventilation. A. J. Picard & Co., $1.50 with plain lenses. With amber lenses $2.

Right—Imitation tortoise-shell glasses for ladies' wear. They are made in one piece and do not fold or bend. A wide cheek-piece serves to keep out dust, dirt, etc. A. J. Picard & Co., $2.

At the left—Goggles of imitation tortoise-shell with gold-filled mountings and folding bows. The folding eye-cups serve to protect the eyes. These glasses are furnished with either amber or plain lenses and are light and comfortable. Lowe Motor Supplies Co., $1 to $5.

Above—Ladies' velour hat with buckskin band. This neat and serviceable sample of motor millinery comes in all colors and is both durable and comfortable, while at the same time being attractive in appearance. Auto Supply Co., $6.50.

One of the pretty silk mufflers which are furnished in all colors and combinations. They are of the best material and are soft, warm and of ample length to prevent slipping out of position. Auto Supply Co., $2 to $10. The hat is described on page 1014.

Photographs by Lazarnick.

New York Car Registrations Total 166,961

ALBANY, N. Y., Nov. 30—The records of the State Automobile Bureau show that registrations and receipts from fees for the first 9 months of 1914 are in advance of those for the entire year of 1913. According to the statistics from February 1 to November 17, there were 166,961 car owners registered as compared with 131,095 last year. Receipts from owners' fees this year total $1,283,895, a substantial increase over the $1,050,215, taken in during 1913.

An additional source of income is the chauffeurs' registration fee. To date there are 65,080 chauffeurs registered, 15,910 paying $5 fees, and 49,170 paying $2 fees. The fees total $177,890. In 1913 there were 55,185 chauffeurs registered who paid $157,866.

To November 17 this year there were 1,741 dealers registered in New York State, the amount of fees totaling $37,007. These figures compare favorably with the 1,735 dealers registered in 1913 and paying $37,080.

2,348 Foreign Cars

There were 2,348 foreign cars registered during 1914 to November 17 as compared with 2,134 in the preceding year.

Miscellaneous receipts totaled $16,871.86 as compared with $14,841.77. These miscellaneous receipts are made up of affidavit fees, lost plates, certificates, badges, etc. Vendee affidavits brought in $10,151 as compared with $7,116 for 1913.

In 1914 there are 1,355 numbers reserved, as compared with 1,017 in 1913. There are 418 registrations without fee, an increase of 108 over 1913. The commercial registrations without fee totaled 130 as compared with 75 last year. Owners' $5 fees number 68,059 and amount to $340,295. For 1913 these statistics were respectively 49,419 and $247,095. Owners' $10 fees number 50,764 and amount to $507,640 as compared with 42,176 fees amounting to $421,760 last year. The $15 fees totaled 18,894, bringing in $283,410. In 1913 16,762 fees brought in $251,430. This year $25 fees number 1,272, a significant decrease from the 1,358 of 1913.

Commercial fees of $5 were paid by 15,973 owners as compared with 12,263.

There are 60,628 original full rate numbers and 94,882 renewals. Last year the figures were 50,238 original numbers and 72,125 renewals.

There are 6,575 owners paying half rate or $2.50 in the $6 class as compared with $3,802 last year. When a car has been registered 4 years in succession it is entitled to half rate. In the $10 class 2,957 registered this year for $5. In the $15 class the half rate registrations totaled 925 and in the $25 class they amounted to 24.

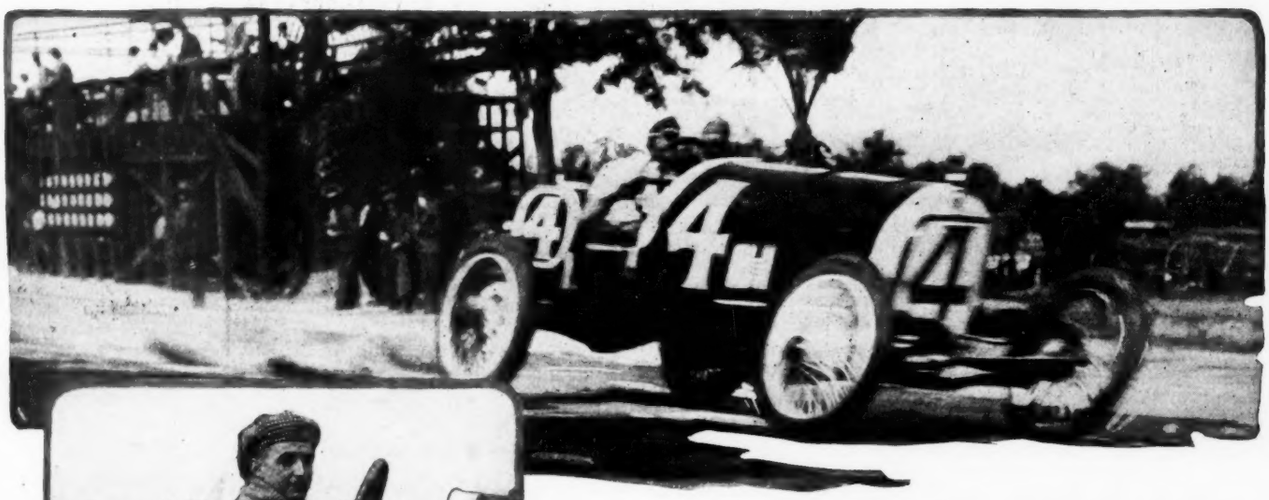
Owners, Chauffeurs and Dealers Registered in New York State

REGISTERED	NO.	FEES	NO.	FEES
Owners	166,961	$1,283,895	131,095	$1,050,215
Chauffeurs	65,080	177,890	55,185	157,866
Dealers	1,741	37,007	1,735	37,080
Foreign cars	2,348	.....	2,134	.....

New York Registration from 1901 to Date

YEAR	OWNERS	CHAUFFEURS	RECEIPTS
1901	954	.....	$954.00
1902	1,082	.....	1,082.00
1903	6,412	2,382	9,181.00
1904	6,739	2,265	14,249.14
1905	8,625	4,387	25,953.50
1906	11,753	7,067	35,463.27
1907	13,985	9,388	44,580.10
1908	15,480	10,335	53,736.36
1909	24,059	12,533	81,772.67
1910 to July 31	19,252	9,595	57,694.00
1910, Aug. 1 to Feb. 11	62,655	27,416	339,845.90
1911	83,969	35,890	905,179.37
1912	107,262	45,347	1,056,620.80
1913	134,405	56,702	1,275,727.27
1914 to Nov. 17	166,961	65,080	1,461,785.90
Totals	664,663	288,487	$5,363,825.28

Pullen Wins Corona Race at 87.7 M. P. H.



Ed. Pullen swinging into the home stretch in his victorious Mercer which won the 301.89-mile road race at Corona, Cal., on Thanksgiving Day at an average speed of 87.7 miles per hour

Ed. Pullen, winner of the Thanksgiving Day road race at Corona, Cal., in his Mercer racer

Mercer Covers 302-Mile Course at a Record - Breaking Speed —Oldfield's Maxwell Second— O'Donnell, Duesenberg, Third

CORONA, CAL., Nov. 26—The greatest automobile race ever held on the Pacific Coast, the second annual Corona road race of 301.89 miles, was won by Eddie Pullen in a Mercer. He averaged 87.7 miles an hour, covering the 109 laps of the 2.76 miles in 3 hours 26 minutes 2 seconds.

It was a close, nerve-racking contest throughout. Pullen got the green flag at the finish, then Oldfield in the Maxwell shot across the line with O'Donnell's Duesenberg just 40 seconds behind. Less than 2 minutes after O'Donnell finished, DePalma crossed the tape in his Mercedes.

By capturing first place Pullen gets first money, the purse being $6,000; Oldfield in second place takes $2,500; O'Donnell wins $1,500 for third honors; DePalma $1,000 for fourth position; Gordon $750, or fifth money and Carlson takes the remaining $300 for sixth place.

Pullen Takes the Lead

At the start Pullen took the lead and set a fast pace. For twenty laps he held the lead by a fair margin, averaging better than 96 miles per hour, with his right front tire giving way. When tire trouble set in he was thrown back several places losing practically a lap. Babcock in the Sunbeam, took the lead at the thirtieth lap and held the lead until the fifty-third lap when he struck a small dog and broke a steering arm. This was repaired and Babcock went back in the race but many laps behind, and when the eighty-seventh lap was reached, the repaired damage showed up again and the Sunbeam retired.

Earl Cooper in a Stutz held the lead from the sixtieth to eightieth lap when he was overhauled by Pullen and forced back into second position. Cooper held a close second from then to lap 108, when he went out with broken timing gears.

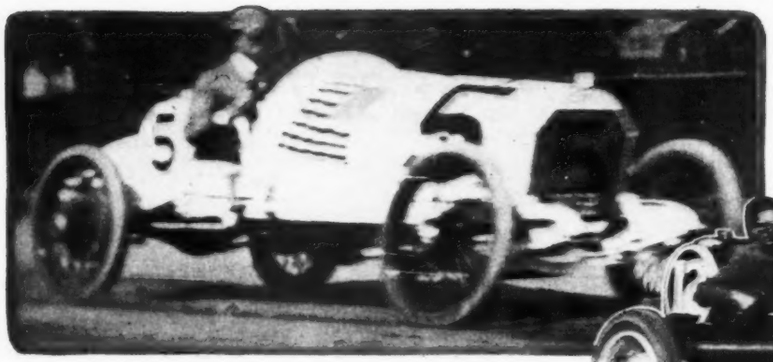
The only accident of the race was the wreck of the Sun-

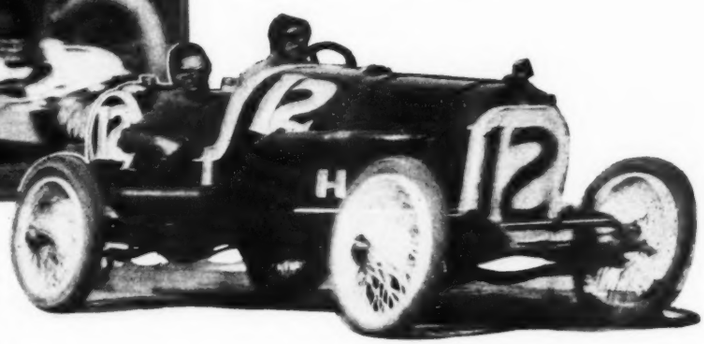
Finishing Times in Corona Race

Car	Driver	Time	M.P.H.
Mercer	Pullen	3:26:02	87.7
Maxwell	Oldfield	3:29:58	86.3
Duesenberg	O'Donnell	3:31:12	86.0
Mercedes	De Palma	3:31:51	85.0
Gordon-Special	Gordon	3:48:29	84.0
Maxwell	Carlson	3:51:10	78.5
Mercer	Nikrent	3:55:10	77.2

How the Cars Went Out

Car	Driver	Lap	How Eliminated
Marmon	D'Alene	1	Wrecked in smoke
Duesenberg	Alley	5	Broken clutch spring
Klein-King	Ball	30	Broken connecting rod
Peugeot	Rickenbacher	36	Transmission trouble
Stutz	Klein	34	Cracked cylinder
Stutz	Lewis	43	Broken bearing
Sunbeam	Grant	43	Burned up
Duesenberg	Callahan	58	Engine trouble
Marmon	Cadwell	63	Ignition trouble
Sunbeam	Babcock	88	Broken steering arm
Stutz	Cooper	107	Stripped timing gear
Mercer	Ruckstell	108	Out of gasoline





Left—Huntley Gordon sending his Gordon Special along the last stretch of the Corona race. He finished in fifth place

Below—Louis Nikrent in Mercer No. 12 as the car appeared in the Thanksgiving Day road race over a 301.89-mile course at Corona

beam, driven by Harry Grant. The driver had built two 25-gallon gasoline tanks under the car. This was supposed to remedy the top-heavy trouble which has been claimed for the car. Grant was driving fast in fifth place on the forty-seventh lap, when a rear wheel collapsed. As the car had but about 6 inches clearance, the tanks dragged and sprung a leak. The scraping axle raising sparks on the course, set fire to the trail of gasoline. Before Grant could stop, the flames had caught up to the car and the fast racer was soon enveloped in flames. Unable to get out of the car, Grant and his mechanic, Harold Smith, were severely burned before they could get clear.

Early Eliminations

Almost from the start, the cars began to go out. The Marmon, driven by D'Alene, did not complete the first lap. Tom Alley, in the Duesenberg No. 20, was forced to retire at the end of the fifth lap with a broken clutch spring. The Klein-King, driven by Guy Ball, broke a connecting-rod and retired in the thirtieth lap.

The Peugeot, driven by Rickenbacher, held second position to Pullen's Mercer during the first twelve laps. A tire change was the first setback and in the thirty-sixth, Rickenbacher went out with transmission trouble.

Fast Stutz Speed

Arthur Klein, in the Stutz No. 2, averaged 98 miles an hour to the thirtieth lap when he stopped at his pit for a complete change of spark plugs. Going out again and traveling at a high rate of speed, Klein cracked a cylinder and was out. The cylinder had been welded the day before the race.

Dave Lewis, in the Stutz No. 3, was running in eighth position in the forty-third lap when a bearing burned out in the transmission.

A. A. Cadwell in the Marmon No. 11 changed a set of spark plugs in the sixty-third and after losing about twenty laps, returned to the race and was still running when he was flagged off the course after the last car in the money had finished.

Flying Speedway Start

At the start the leaders set a fast pace. This was largely due to the rolling start. The cars were lined up in sets of fours. It was a perfect start. The course was so fast that the drivers wore face masks, with one or two exceptions, to protect them from the small rocks thrown by other cars.

In the front rank were Oldfield, O'Donnell, Rickenbacher and Klein. The motors were started and the cars rolled around the course in a cloud of smoke. Oldfield tried for the jump at the start, but the starter held him back and when they got the flag, every car was in perfect position.

Nearly 100 M. P. H.

Averaging 98.6 miles an hour up to the thirtieth lap, the drivers circled the course like crazed demons, even Oldfield, said after the race that he never saw such a race and admitted that he was carried on by the speed of the others, realizing all the time that it was risky to do it, and expecting an accident at every turn.

When the cars began to thin out and the leaders came to the pits more often, the pace was cut down. From the third lap, Carlson, in Maxwell No. 17, had ignition troubles and was unable to get enough speed to catch the leaders. Louis Nikrent, in the small Mercer No. 12, did not have the speed of the other two Mercers nor the Gordon Special, which is a rebuilt Mercer. Nikrent drove a conservative and heady race, and finished just one behind the last money place.

DePalma, in the Mercedes, forged up to the front but when

Times of Contesting Cars and Purses in Corona 301.89-Mile Road Race

CAR	DRIVER / M.P.H. / Lap	96.9 10	96.2 20	98.6 30	90.4 40	90.4 50	88 60	88 70	86.5 80	88 90	87 100	86.5 109	M.P.H.	Pos.	Purse
Mercer	Pullen	18:10	37:38	59:15	1:16:20	1:33:41	1:55:36	2:13:28	2:31:38	2:51:53	3:08:55	3:26:02	87.7	1	$6,000
Maxwell	Oldfield	19:53	37:55	57:09	1:16:10	1:35:35	1:54:49	2:14:25	2:34:20	2:55:52	3:13:06	3:29:58	86.3	2	2,500
Duesenberg	O'Donnell	18:48	39:29	59:09	1:18:39	1:37:21	1:58:27	2:18:37	2:35:37	2:54:14	3:12:49	3:31:12	86	3	1,500
Mercedes	De Palma	18:35	38:14	57:51	1:16:12	1:38:52	1:56:59	2:15:14	2:34:12	2:54:44	3:14:48	3:31:51	85	4	1,000
Gordon-Spec.	Gordon	22:05	41:45	1: 1:35	1:21:29	1:42:03	2: 2:15	2:22:19	2:45:12	3: 8:46	3:29:24	3:48:29	84	5	750
Maxwell	Carlson	19:08	39:05	1: 8:15	1:28:30	1:52:35	2:13:30	2:34:10	2:54:30	3:14:50	3:36:10	3:51:10	78.5	6	300
Mercer	Nikrent	21:13	42:17	1: 3:39	1:24:24	1:47:19	2:11:15	2:35:11	2:55:24	3:16:14	3:35:18	3:55:10	77.2	7	....
Mercer	Ruckstell	18:10	39:06	57:45	1:16:30	1:34:40	1:55:31	2:13:50	2:36:15	2:55:55	3:14:25				
Stutz	Cooper	18:44	38:57	55:32	1:15:48	1:34:04	1:54:31	2:12:34	2:32:22	2:52:10	3:10:19				

Ruckstell on Mercer when in 4th place, ran out of gas on last lap.

Cooper in 2d place when he broke timing gears in next to last lap.

Equipment Used on Contesting Cars in Corona Road Race

CAR	DRIVER	MAGNETO	PLUGS	CARBURETER	OIL	TIRES	WHEELS
Marmon	D'Alene	Bosch	Bosch	Rayfield	Motoreze	Silvertown Cords	Wood
Stutz	Klein	Bosch	Bosch	Schebler	Motoreze	Firestone	Houk
Stutz	Lewis	Bosch	Bosch	Schebler	Motoreze	Firestone & Braender	Houk
Mercer	Pullen	Bosch	Bosch and Rajah*	Rayfield	Castor	Silvertown	Rudge-Whitworth
Gordon-Spec	Gordon	Bosch	Penn Yan	Master	Oilrite	Goodyear	Houk
Peugeot	Burman	Bosch	Rajah	Master	Castor	Nassau	Rudge-Whitworth
Peugeot	Rickenbacher	Bosch	Rajah	Zenith	Oilzum	Nassau	Rudge-Whitworth
Stutz	Cooper	Bosch	Bosch	Schebler	Motoreze	Firestone	Rudge-Whitworth
Sunbeam	Grant	Bosch	K.L.G.	Master	Castor	Palmer Cord	Steel and Wood
Duesenberg	Callaghan	Splitdorf	Bosch	Master	Oilzum	Riverside	Steel
Marmon	Cadwell	Bosch	Bosch	Rayfield	Motoreze	Silvertown Cords	Houk
Mercer	L. Nikrent	Bosch	Bosch	Rayfield	Castor	Silvertown Cords	Rudge-Whitworth
Maxwell	Oldfield	Bosch	Rajah	Harroun	Monogram	Firestone	Houk
Klein-King	Ball	Bosch	Bosch	Master	National	Firestone	Houk
Mercer	Ruckstell	Bosch	Bosch	Rayfield	Castor	Silvertown	Rudge-Whitworth
Maxwell	Carlson	Bosch	Rajah	Harroun	Monogram	Silvertown	Houk
Sunbeam	Babcock	Bosch	K.L.G.	Master	Castor	Palmer Cord	Steel
Duesenberg	O'Donnell	Splitdorf	K.L.G.	Master	Oilzum	Riverside	Rudge-Whitworth
Duesenberg	Alley	Splitdorf	Rajah	Schebler	Oilzum	Riverside	Wood
Bergdoll-Spec	Bergdoll						
Mercedes	R. DePalma	Bosch	Bosch	Rayfield	Monogram	Nassau	Rudge-Whitworth

*Rajah on one side.

the cars began to fall out, he dropped back and drove his usual heady race, but the course held the speed of the leaders and DePalma took only fourth place.

Oldfield was a feature of the race. He had only driven the Maxwell twice in practice for the race, and was not in physical condition. He said after the contest that he could have got more speed out of the car early in the race but as he did not know the machine, played safe. His non-stop record was one of the features of the race, however.

For 109 laps or 301.87 miles, Oldfield drove without a stop. Several times he was signaled from the pits to stop for oil and gas, but he shook his head and went on. Twice he had his mechanic open the tanks and look in to see how much fuel was left. This was done on the backstretch, where the course climbs about 100 feet, in the seventy-third and again in lap 103.

A Close Contest

At the end of the sixty-seventh lap with an average of 88 miles an hour, Cooper was in the lead, 48 seconds ahead of Pullen, and there were but ten cars left. Cooper was third and DePalma fourth, Ruckstell was in fifth place and O'Donnell sixth. Gordon and Carlson were together for seventh. At the seventieth lap Cooper still had the lead with Pullen a few seconds in his rear, but Ruckstell had taken third over Oldfield.

With a lead of 4 seconds, Pullen led the race at the end of the eightieth lap. Cooper was in second place; Oldfield third; DePalma fourth; Ruckstell having fallen back to fifth on account of a tire change, and taking on water, oil and gas. O'Donnell was in fifth.

When 100 laps had been covered, Pullen had the lead with 1 minute 36 seconds over Cooper. Ruckstell was third and O'Donnell had climbed into fourth over Oldfield.

This order continued until lap 108 when Cooper broke his timing gears. It was almost certain that Ruckstell would take second, giving the Mercer first and second, but on the last lap Ruckstell ran out of gasoline on the back stretch.

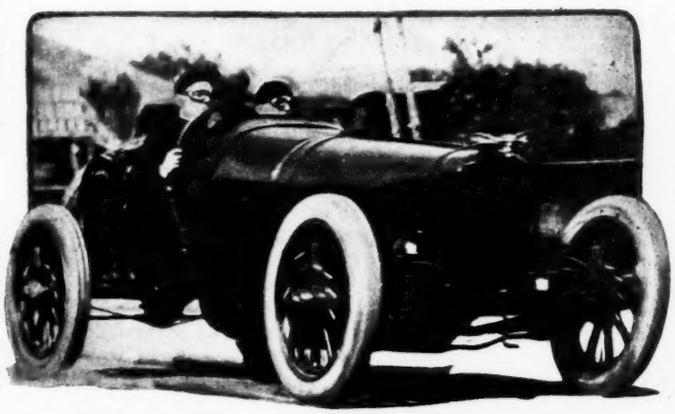
Close Finishes

Pullen finished amid the cheers of the 100,000 spectators who lined the course. Then came the Maxwell, driven by Oldfield, 40 seconds ahead of O'Donnell in the Duesenberg. Less than 2 minutes after O'Donnell finished, DePalma crossed the line. Fifth and sixth places were still in doubt and Gordon, Carlson and Nikrent were all the drivers left to fight for place. Although the Marmon was still on the track it was far in the rear.

Gordon had too much speed for Carlson, and took fifth. The last place went to Carlson, with Nikrent coming in eighth, four minutes out of the money.

It was truly a great race. There were 15,000 automobiles parked around the course and many thousands parked in the city back from the course. The attendance was estimated at 100,000. The first four cars to finish broke the world's speedway record and the road race record as well.

A new non-stop record was established and the Corona course which is now admitted to be the fastest in America with the possible exception of the Indianapolis speedway, is credited with the fastest time ever made.



Harry Babcock on Sunbeam No. 18 shortly after the start

Barney Oldfield tuning up his Maxwell before the start

Magneto Spark Vs. Battery-Coil Spark

Oscillograms Used to Show Characters of Both Sparks Wherein They Differ —Discharge Across Spark Plug Varies with Different Systems— Fuel Economy Directly Affected

By Dr. D. H. Cunningham

Chief Engineer, Splitdorf Electrical Co.

¶ EDITOR'S NOTE.—*The oscillograms reproduced in this article were made by Dr. H. B. Williams and Dr. R. H. Cunningham, chief engineer of the Splitdorf Electrical Co., Newark, N. J. The experiments were made with an Einthoven string galvonometer in the Department of Physiology, Columbia University.*

NEWARK, N. J., Editor THE AUTOMOBILE:—The character of the spark bridging the gap in a spark plug with current from a magneto is different in many respects from the spark furnished by a battery-coil system and it is the purpose of this communication to show wherein these two sparks differ and how this difference affects the ignition of the explosive charge.

Why the Magneto?

Magneto ignition superseded old-time battery ignition by reason of its greater reliability. For, in addition to ignition troubles arising in connection with electro-magnetic vibrators, mechanical timers, and timer-distributers, the batteries proved to be non-durable and subject to rapid deterioration on standing.

Although the modern storage battery is a great improvement upon those in use 8 or 10 years ago, nevertheless experience teaches that even the present-day battery is far from being the dependable and durable reservoir for the storage of electricity which the exigencies of automobile ignition require.

The magneto, being a permanently excited electric generator, is always ready for its duties, requiring very little attention except an occasional drop of oil to its bearings and an infrequent adjustment of its platinum contacts. Unlike the storage battery, it may stand idle for months or years without attention and undergo no deterioration, being ever ready to deliver the required spark at a pull of the starting crank.

Battery Deterioration

All battery makers emphasize the necessity of care of the battery. The fluid electrolyte must be kept at the proper level. The battery must not be seriously overcharged, nor must its charge be allowed to fall too low, nor must too great an intensity of current be withdrawn from it at any time, for damage to the battery will result. In other words, the most important backstay of the automobile, the ignition, has for its anchorage, in the battery, a rather uncertain and variable foundation requiring constant care.

Promoters of the retrogressive innovation of return to ancint battery ignition glibly inform th uninitiated trusting intending purchasers that since the introduction of the lighting dynamo and its usually accompanyng electric starter, a reliable source of electric energy for the ignition will always be at hand; theoretically an alluring talking point for battery ignition, but in practice, seldom maintained for any great length of time. Mere observation at night of the lamps of the average automobile fitted with electric starting and lighting outfits, when standing with resting engine, usually demonstrates that few of their batteries are suffering from a plethora of overcharge. In fact, the lamps of most of the cars indicate that in but few of them are the batteries even normally charged, while in the majority the batteries appear to be undercharged.

Present-Day Gasoline

In former years when one bought gasoline, we received a fluid with a gravity of about 72 degrees Baumé. Nowadays we are lucky if we get gasoline of 65 degrees Baumé, and often we are handed lower grade gasoline of even 58 degrees Baumé.

This clearly indicates that what is now sold for gasoline is not the same kind of fluid as that of former years. Since the 72 degrees Baumé gasoline of former years was not a fluid of definite chemical composition, but was a fractional petroleum distillate composed chiefly of a mixture of hydrocarbons of the marsh gas or paraffin group, *it is evident that the lower grade gasoline of 58 degrees Baumé contains a smaller proportion of the more volatile components of the mixture and a greater proportion of the less volatile or heavier hydrocarbon members of the paraffin series.*

Gasoline Diagram

Without any great effort of the imagination one may readily form a crude mental picture of the probable microscopic structure of the charges of explosive gas obtained by carburetion of the above mentioned high-grade and low-grade gasolines. Thus, in diagram A, Fig. 1, the light space or white within the square may be considered to represent that part of the charge of gas that has been fully volatilized and thoroughly mixed with a requisite volume of air. The scattered globules of various sizes represent the various heavier hydrocarbon constituents that have been nebulized by the inflow of air through the carbureter during the suction cycle of the engine.

In diagram B, Fig. 1, representing a carbureted charge of a lower-grade gasoline, for instance, from gasoline of 58 degrees Baumé, as generally sold today, the space within the square is slightly shaded to indicate the more or less incompleteness of the volatilization, and many more nebulized globules appear in the explosive mixture. In other words, such a mixture consists practically of gasoline and kerosene and experience teaches us that the greater the proportion of kerosene present the greater is the difficulty of initiating the ignition of such mixtures by means of a thin *ionizing* spark of very brief duration.

While it is probable that ionization is intimately concerned in initiating ignition when a suitable explosive volume of a pure gas, such as methane* is used, my personal experience has been that where the mixture has been of a composition resembling more or less that depicted in diagram B, Fig. 1, namely, from 58 degrees Baumé gasoline, the use of a flame

*W. M. Thornton, Proceedings of the Royal Society May 28, 1914, page 272.

or arc spark of appreciable duration always proved to be the best form of ignition.

That the spark delivered by a properly proportioned and constructed high-tension magneto contains the so-called arc-flame is readily capable of demonstration, Fig. 2, by means of a sufficiently sensitive oscillograph; and furthermore, the intensity of current forming the arc and the time of its duration can be measured with considerable exactness, so that an accurate comparison can be made with the spark obtained from an induction coil actuated by a mechanical circuit breaker and current from a battery.

At each interruption of the primary current passing through an induction coil, the resultant spark or sparks have been demonstrated by scientists years ago to consist of but one single discharge of an extremely brief duration, or of several successive sparks or discharges, usually oscillatory in character and strongly damped.

Since the orthodox spark coil consists of two closely coupled mutually inductive electric circuits both containing inductance, capacity, and resistance, and since the terminals of one of these circuits, the high-tension or secondary circuit, are connected to the capacities of the high-tension cables of the plugs and of the frame of the automobile, with one or often more spark gaps included in the external circuit, it is probable that the secondary discharge over the spark gap or gaps is oscillatory in character, and it is evident that the frequency and damping of these oscillations will depend upon the magnitudes of the inductance, mutual inductance, resistance, and capacity of the circuits.

With the small induction coils usually employed with battery ignition, the magnitudes of the preceding factors are relatively speaking minute, while the frequency of the oscillations is correspondingly high and the damping strong. In fact, often the frequency of such oscillations is so high that it is hardly possible to obtain a photographic record of them, although their presence can generally be detected with a Gehrke oscilloscope or with a cathode ray or Braun tube.

Spark Character

In Fig. 3 is shown the current curve of a secondary spark delivered across a gap of .025-inch by a so-called single-spark timer-distributor. The capacities of the short high-tension lead and spark gap were very minute, and although a slight irregularity in the descending part of the curve can be detected on close inspection, the frequency of any oscillations present was entirely beyond the range of the instrument employed for their registration.

In Fig. 4, we have the curve of a spark from a larger two-section coil actuated by a type of interrupter that permits a preliminary closure of the primary circuit for 33 degrees. Inspection of the shape of this curve shows that oscillations were undoubtedly present in its descending portion, but their frequency was too quick for the instrument. In order therefore to more closely approximate to the conditions that are in an automobile when the spark plug gap is within a cylinder containing compressed gas, the gap was made .1875-inch, and a capacity equivalent to,—or in this particular instance, probably slightly greater,—that of the high-tension cable and of the frame, engine, etc., of a large six-cylinder motor. By this procedure, the frequency of the oscillations was considerably lowered, and a graph of the series of sparks composing the damped wave train is reproduced in Fig. 5. In other words, Fig. 5 is an analysis of the curve in Fig. 4, and shows that in reality the curve in Fig. 4 is nothing but a series of sparks of very brief duration and not so dynamic in exploding a charge as an arc such as shown in Fig. 2.

The spark plug gap is filled with electrons or ions which in an alternating field vibrate back and forth between the electrodes of the spark plug, Fig. 6. This is the alternation discharge we get with the induction coils such as illustrated in Fig. 5. In the magneto with a discharge similar to Fig. 2 the ions are projected out more into the surrounding gas, Fig. 7, and so tend to a quicker explosion. These ions radiate along the electrostatic lines in the field surrounding the electrodes of the plug. The ion is real parts of the electric charge of the atom and these inconceivable particles fly off

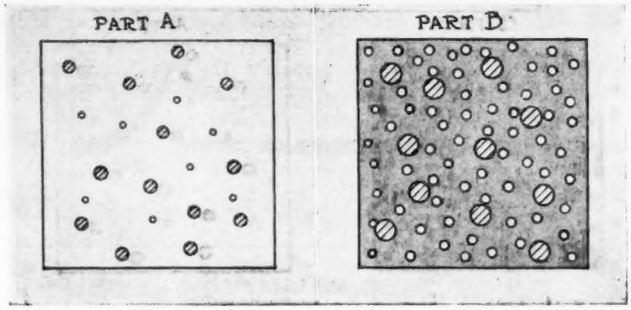


Fig. 1—Part A—Light portions represent fully volatilized part of a charge of gas while the scattered globules are the heavier hydrocarbon constituents nebulized by the inrushing air on the suction stroke

Part B represents a mixture of a lower-grade gasoline such as 58 degrees Baumé. Shaded sections show the more or less complete volatilization of the fuel. Note presence of numerous nebulized globules

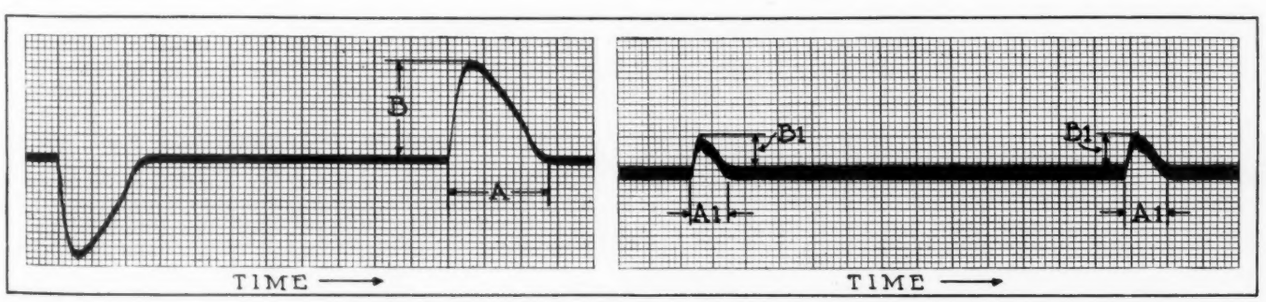


Fig. 2—Oscillogram of magneto high-tension spark bridging a gap in the spark plug .025 inch in length. The speed is 500 breaks per minute and the breaker box is in the retarded position. In this illustration the abscissae each section represents .001 second of time. The ordinates are 1 CM = .040 ampere. The maximum deflection indicated by the vertical line B = .058 ampere. The duration of the arc as indicated by the line A is approximately .0125 second. The maximum deflection B means maximum current which is synonymous with large volume and which characteristic is essential to the modern gasoline engine. The line A representing duration of the spark is interpreted as meaning that the current continues to flow across the gap in the spark plug for this interval

Fig. 3—This oscillogram of a high-tension current was made from a small induction coil actuated by a single-spark interrupter and a 6-volt battery. The gap over the spark plug was .025 inch, the speed 500 breaks per minute. In this illustration the abscissae, each section, represents .001 second time. The ordinates are 1 CM = .040 ampere. All conditions are the same as in Fig. 2. The line B1, which indicates the maximum current, is scarcely one-third in height of the line B in Fig. 2 indicating the same factor. The duration of the spark indicated by A1 shows it to be not one-half that indicated by A, Fig. 2. The frequency of any oscillations present was beyond the range of the instruments used for their registration, owing to their minuteness

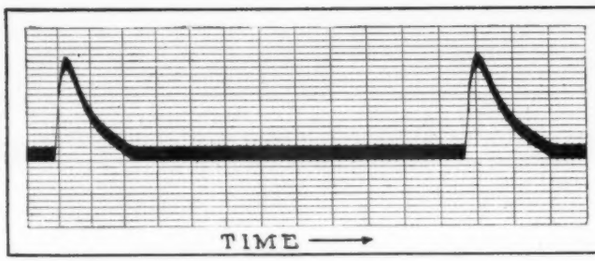


Fig. 4—Oscillogram of high tension current from large two-section coil actuated by a breaker allowing a preliminary 33 degree closure of the primary circuit. A 6-volt battery was used, the spark gap measured .025 inch, and there were 500 breaks per minute. Abscissae, one section, = .001 second. Ordinates, 1 CM equals .040 ampere. As is brought out in Fig. 5, which is in reality an analysis of the above curve, Fig. 4 is nothing but a series of sparks of very brief duration and not so dynamic in exploding a charge as an arc such as is illustrated in Fig. 2, which is that produced by a magneto high-tension spark

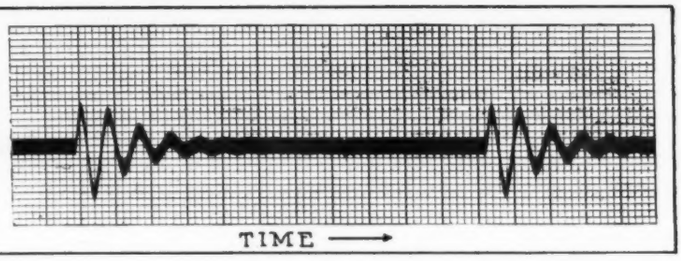


Fig. 5—A damped oscillatory discharge over a spark gap 3/16 inch in length. The coil, used in making this oscillogram was the same as in Fig. 4, namely, a large two-section one actuated by a breaker allowing a preliminary 30 degrees closure of the primary circuit. A 6-volt battery was used. In making this oscillogram the conditions were practically the same as in regular car use, namely, with compression as encountered in a cylinder. It will be noted that each discharge instead of being as in Fig. 4 is a series of very rapid sparks or discharges above and below the line. Abscissae, one section .001 second

into the surrounding gas. Their action is somewhat similar to the mist that hangs in the air around the Niagara Falls. This mist is not a part of the cataract but an effect. The only difference with the ions is that they are radiated into the surrounding gas before the spark begins arcing over the plug, whereas in the comparison of the mist at the falls it follows after the water has been precipitated over the cataract.

Less Current Needed

WORKING WITH BREAK SPARKS OF DIRECT AND OF ALTERNATING CURRENTS, PROF. THORNTON FOUND THAT WHEN CONTINUOUS CURRENT WAS EMPLOYED, FIGS. 2 AND 3, LESS CURRENT WAS REQUIRED TO START IGNITION OF EXPLOSIVE MIXTURES OF GAS. HE ATTRIBUTES THE DIFFERENCE TO THE FACT THAT WHEN ALTERNATING CURRENT IS USED, THE RAPIDLY REVERSING ELECTRIC FIELD ACROSS THE SPARK GAP, FIG. 6, DRAGS THE IONS OR ELECTRONS FROM POLE TO POLE AND PREVENTS THEIR ESCAPE INTO THE GAS. WITH THE DIRECT CURRENT ARC THE IONS ARE PROJECTED OUT INTO THE GAS AND IGNITION IS MORE READILY INDUCED, FIG. 7.

High-Frequency Results

Apropos of the preceding results of Prof. Thornton is an experience that occurred to the writer some years ago during an investigation of the ignition qualities of a certain novel high-frequency magneto-ignition outfit. The spark delivered by this apparatus covered a gap of .5-inch in air, and appeared to be a veritable ball of flame. The effective high-tension oscillatory current from the small oscillator coil measured with a suitable hot-wire milammeter reached the high value of 350 milamperes, with the magneto-generator running at 1800 revolutions per minute. This ignition outfit was tested upon several different makes of four-cylinder motors with the uniform result that the engines were very sluggish, possessed little power on hills, overheated readily, and the speed of the cars lessened at least 50 per cent. From subsequent measurements and calculation the frequency of the oscillations across the gap was probably in the neighborhood of 300,000 per second.

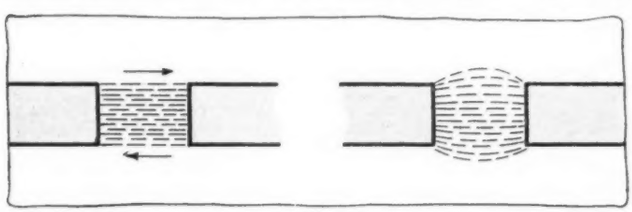


Fig. 6—Left—Diagram of the vibration of electrons or ions between the spark plug electrodes with an alternating discharge such as obtained with induction coils as illustrated in Fig. 5

Fig. 7—Right—Illustrating how the ions are projected out more into the surrounding gas by a magneto discharge such as that obtained in Fig. 2, tending to quicker explosion

Thin, Brief Spark

In other words, when a small induction coil is energized by a feeble primary current during a very brief period, as occurs in many of the present timer-distributor models, the resultant spark appears extremely thin, and is of such brief duration that often imperfect combustion of the explosive mixture with diminution of power results.

At high engine speeds, owing to the shortening of the time of closure of the primary circuit, the magnetic field of the coil does not have time to build up properly and hence the resultant sparks become progressively weaker and weaker and even fail altogether, unless a precaution similar to that used in the days of early battery ignition is taken; that is, the use of a type of timer in which the time of closure of the battery current through the primary of the coil is automatically increased as the speed of the engine increases.

Former experience with such appliances has demonstrated that, although these more or less complicated mechanisms frequently work well for a short time after their installation upon the car, ultimately they become loose, wabbly, out of time, and succumb to the effects of the action of grit, oil and vibration.

The Magneto Spark

Quite different, however, is the behavior of the spark from a high-tension magneto as the speed of the engine increases. Instead of growing progressively thinner it becomes hotter and hotter, until at about 1800 revolutions per minute of the armature, the maximum strength of the alternating current forming the arc-flame discharge between the spark plug points becomes approximately constant, and since each arc or spark lasts for an appreciable time and contains ample heat, it is evident that, as an ignition device for the highest engine speeds, so far nothing has been found that will fulfill the requirements as simply and effectively.

Spark at Slow Speeds

In former years, it must be admitted, that magnetos had not reached the perfection to which they have attained at present, nor was the present slow-speed, powerful gasoline automobile engine so much in evidence, hence to facilitate starting, or to be able to run on high gear at the very slow speed of 3 or 4 miles per hour, recourse had to be had to battery ignition. But high-tension magnetos capable of giving good sparks at 50 revolutions per minute are now made that will permit of this, provided the engine at such slow speeds is capable of propelling the car.

Advocates of battery-coil ignition extol the great advantage of the extensive range of spark advance necessarily provided with such outfits in order to compensate for the electrical lag inherent in such a system, but none draw attention to the fact, that in order to spark the engine with proper reference to its various speeds, almost constant manipulation of the spark advance lever becomes necessary. The closest attention of the driver is required at all times to maintain a smooth running of the engine. With modern types of magnetos, extensive range of advance is provided.

Simple Wiring

In the present combination of battery, ignition-lighting-starting outfits, one glance at the innumerable rat's nest of ignition cables, lighting cables, starter cables, cut-outs, and cut-ins, fuse boxes, etc., is enough to give one cold chills when he thinks of how he would be off for ignition were one or more short circuits to occur in that tangle of wires, when he is miles from anywhere on a stormy night. Generally, it means walking to the nearest garage and a tow, unless some good Samaritan in another car happens along.

On the other hand, consider the extreme simplicity of the wiring required by the usual high-tension magneto. Besides the requisite high-tension leads to the spark plugs only one wire leading to a simple grounding switch is necessary.

During the past season, numerous chauffeurs of cars fitted with battery ignition were interrogated for information regarding fuel consumption and car speed. Some of them having driven no car with magneto ignition could give no definite information, but none were enthusiastic concerning the speed of their car; all, in fact, admitted that their cars were not speedy. Many of them, however, were used to magneto ignition; in fact, a number of them had driven cars similar to what they had, but fitted with magneto ignition instead of battery ignition. Without exception, those with that experience regretted the fact that their bosses had bought the new model car fitted with battery ignition and expressed a very decided longing for their former cars with magnetos.

Where they had formerly with magneto ignition been able to get about 14 or 15 miles to the gallon of gasoline and had been able to attain a speed of 50 miles per hour, after the same type of car had been fitted with the battery ignition, they could get only about 11 or 12 miles to the gallon of gasoline, and could with difficulty get up to a speed of 40 miles per hour.—DR. R. H. CUNNINGHAM, Chief Engineer Splitdorf Electrical Co.

Baltimore Municipal White Truck Has Wireless Equipment

THE Electrical Commission of the City of Baltimore has placed in service a motor truck which performs an astonishing number of duties in the maintenance of the municipal conduit system. The truck was built by the White Co., Cleveland, O., and combines a vehicle for transporting repair crews and supplies and embodies a pumping station, lighting plant, repair shop and a wireless equipment, enabling the workers to keep in constant touch with headquarters.

The wireless equipment, unlike any other portable set, enables the crew to receive messages while the truck is being driven along the streets. When ready for action it is capable of pumping 12,000 gallons of water per hour from a flooded conduit and it will furnish a flood of light for inspection and repairs, to say nothing of carrying all the necessary paraphernalia.

Truck Is Receiving Station Only

The most unusual and interesting feature of the outfit is the wireless equipment, through the agency of which the department keeps in constant communication with its trouble crew, so that all emergency calls can be handled with the greatest dispatch before serious damage can ensue. The truck serves as a receiving station only.

The antennæ are suspended immediately under the roof of the car and are made of approximately 425 feet of No. 14 stranded, rubber insulated, copper wire, which was laced back and forth until forty wires were obtained with a separation of 1 inch.

A series of rigid tests proved conclusively that the equipment is entirely practical and that excellent results can be obtained, through the aid of a simple code of signals without resorting to the employment of trained wireless operators. It was also demonstrated that direct earth connection was unnecessary, inasmuch as the iron framework of the chassis serves admirably as a counter-poise ground, thereby enabling the truck to receive while in motion.

During all the preliminary tests the truck never failed to intercept any message sent to it within a radius of 10 miles of the sending station, and even under the most unfavorable conditions, with the truck running at full speed and blanketed by tall buildings of steel construction, no difficulty was experienced in reading the messages.

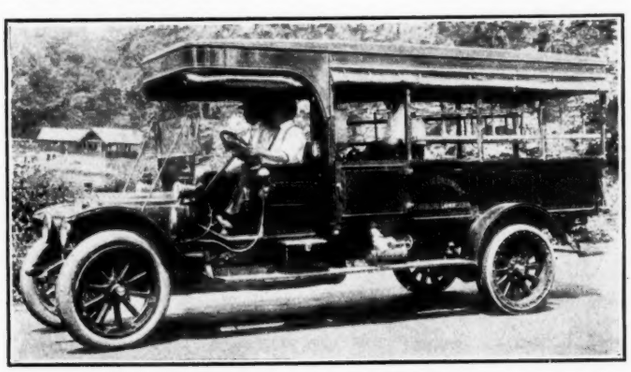
The body is specially constructed. Hinged entrance doors, one on each side, greatly facilitate the operation of the equipment, while hinged double doors in the rear provide a ready access to various inclosed compartments used as repositories for suction hose and other paraphernalia. The overhanging hood also forms a locker compartment which is used for the storage of boots and water-proofing clothing.

12,000 Gallons-per-Hour Pump

Just in the rear of the driver's seat is mounted a gasoline-driven centrifugal pump which is capable of exhausting water from manholes at the rate of 12,000 gallons per hour. For the sake of economy the pump is not driven by the 30 horse-power truck engine, but is directly connected to an independent four horse-power gasoline marine engine.

The pumping engine, however, is cooled from the same source as the larger engine, that is, water is pumped from the bottom of the truck radiator through flexible metal hose to the marine engine and returned to the top of the radiator after circulating around the cylinders of the truck engine.

The pumping engine also operates a small dynamo, which, in addition to furnishing ignition for the marine engine, supplies sufficient current for illuminating manholes. By the aid of the portable lamps, which can be plugged in on the dynamo current, duct chambers may be examined for a distance of 50 feet to determine the nature and cause of obstructions in the conduits.



White truck in the service of the Electrical Commission of the City of Baltimore, which, in addition to performing manifold duties, is fitted with a wireless receiving station by means of which it keeps in constant communication with the office

Top and Upholstery Often Neglected

Many Car Owners Do Not Realize Value of Their Part in Appearance—Artificial Leather Improving in Quality and Gaining in Use—Carpets Important

By M. C. Hillick

THE last word in top and upholstering goods is probably Morocco, water grain, French finish, hand-buffed leather. This leather is to be had in either pebble or straight grain, and in all the popular colors, black, green, etc. The Morocco leather, finished as above, represents the most elegant and expensive class of trimming leathers used in automobile work.

Next to the Morocco is the hand-buffed Spanish leather likewise furnished in practically all colors. This Spanish material yields beautiful effects. These leathers may also be obtained in machine-buffed form, and while they may not suit the buyer of exacting inclinations they nevertheless are capable of wearing durably and show a finish concerning which even the expert has small reason to complain.

Buffed Leather, etc., Good

Specially buffed leather, split grades, and so on, are extensively employed in automobile top and upholstery work, and such leathers show an attractive form and finish, and stand up nicely under severe service at a moderate cost.

Black enamel top leather, either in pebble or straight grain, and in various grades is, in addition to the above, being put into automobile trimming.

In the making of leather substitutes there is no end. The popularity of these goods, in all conceivable colors and styles of finish, is a matter of comparatively recent history.

With the great middle class of car buyers these artificial leather fabrics are favorites because they furnish such a variety of style, color and design, at a reasonable expense, that all may enjoy them.

Artificial Leather Gains

The increasing demand for artificial leather is, moreover, due to the steadily decreasing supply of cattle hides the world over. The present year, it is stated by those having access to the statistics, imported hides have constituted fully 45 per cent. of the total amount of raw leather used in this country. Should the prevailing conditions in the hide market fail to mend in the near future we may reasonably expect to find the consumption of artificial leather enormously increasing.

When the production of artificial leather first became a noteworthy business the process consisted, in the main, of covering cloth with a flexible composition and then embossing the resultant product in imitation of leather.

Processes Are Improved

Improvement in manufacturing process has developed a fabric which today is suitable for tops, curtains, cushions—in fact, suitable for anything about the automobile that leather is suitable for.

The most essential feature, among many, of the artificial leather, is the coating, and for the splendid resources of this medium we have to thank the chemist. The requirements of the coating are manifold. In the first place it must retain its chemical composition without change throughout all its life. During the cold of winter and the heat of summer, it must retain a uniform suppleness and flexibility. It must have toughness of texture to allow for the mechanical manipulation and stretching necessary to shape it into the fashions designed by the trimmer. This coating composition must have adhesive properties of such power that, regardless of time or nature of service, it will not peel. Originally it was applied to coarse-woven fabrics, but heavy sateen is at the present time chiefly, or at least very largely, used as the backing up cloth, although, of course, it can be, and, in fact, is applied to many fine cloths.

Close Imitation Required

No great demand for the embossing of this artificial leather for top and curtain uses exists. However, for cushions and upholstery goods applied to the interior of the car there is a large market, and the call is for the closest possible imitation. That public requirements in this respect are being successfully met is attested by the fact that expert judges of leather sometimes mistake the artificial material for genuine leather. The remarkably real feel and appearance of the artificial leather is due in large part, it is said, to the exceedingly fine embossing plates produced through the medium of electrotyping processes from the genuine leather.

Carpets a Factor

Carpets constitute an important feature of automobile upholstery work. Not only should they harmonize in color and design with the other interior appointments of the car, but they should, moreover, accentuate and add to the general charm and luxury of the whole upholstering scheme.

The loosely woven, flimsy carpet that persists in creeping under one's feet is a poor investment. So, too, may we describe the carpet carrying an inferior dye that discolors and bleaches out. Insist on the carpet with a guaranteed fast dye.

Quality Most Important

Carpets are furnished in many colors, kinds, and qualities, among which you will find horse hair in mixtures fancy and plain, wools, worsteds, jutes, and so on; but whatever the sort or color, make quality, first of all, the basis of your choice. Then see that the fitting is correct, that the carpet is well made, and that in all respects it is a distinct addition to the artistic appearance of the car interior.

The closed type of car is showing many beautiful novelties in upholstering fabrics. Among the recently introduced novelties are such leaders as bedfords, Parisian and Vienna cloths, etc. In broadcloth the so-called Four-in-Hand fabric is probably one of the best known. It has quality, richness of effect, fineness of finish, and great durability, the latter a very telling factor in the case of a material that is expected to do service for more than a season or two.

Plain Cloths Popular

The popularity of plain cloths, broadcloth finish, is notably on the increase among exclusive users of the closed car. These cloths reflect a modest, but unmistakable elegance quite unsurpassed by other textile fabrics, and they con-

tinue to have this refinement of finish until well worn beyond the point of renovation or repair.

Foreign fabrics for use in the above class of cars are said to be superior in practically all points to those of domestic manufacture, and recent tariff reductions have brought these foreign made goods to the consumer in this country at no advance in cost over the domestic article. However, should the present European war long continue the "Made in America" goods must suffice. The domestic manufacturer, it would seem, has only to create novelties in design, increase their suitability to automobile requirements, improve their finish, and impart to them the required measure of durability, in order to occupy a preeminent position in this field of work.

Bad Garage Practices

In the care of the car top, trimming and upholstery furnishings, etc., the car owner may very well regard it as a matter to be vitally concerned with. Garage practices are too often ruinous to the reasonable wear and the original appearance of the fabrics employed. Leather, and good artificial leather materials will naturally stand much abuse without, for a time, showing evidences of brutal treatment. On the other hand, the upholstery and interior furnishings of the car reveal at once the lack of care, or the wrong kind of care, which the garage attendant or the chauffeur may be guilty of. Many of the fine upholstery fabrics, in cleaning, should be worked over with a brush; never with an ordinary whisk room.

Special Upholstery Brooms

There are soft point brooms now specially furnished for this work which readily remove light dust without injury to the cloth. The vacuum cleaner properly handled will extract all manner of dry dust and dirt from the upholstery and the car interior. Grease spots, oil smears, and stains of many kinds may be removed from the cloth upholstering by saturating a piece of the same goods as that contained in the upholstering with ether, and rubbing the cloth sharply over the smear or stain. If, for any reason, the strength of the ether needs to be reduced this may be accomplished by mixing it with pure grain alcohol. Ether mixes in all proportions with alcohol, either grain or denatured. It should be used with great care, however, being very inflammable and its heavy vapor is a source of much danger from fire. Nevertheless, as a simple, effective medium for extracting stains, grease spots, etc., from cloth goods, without injury to the finest fabrics, it is unexcelled, if applied as above directed.

In looking after the automobile top fabrics, the leathers, hand or machine buffed, so long as the enamel remains in good condition will need when mud splashed or stained with the accumulations of travel, scarcely more than wiping off with a soft wool sponge wet in a weak solution of castile soap and soft water. It is a good plan to defer the application of dressings, renovators, etc., until the wear of the goods makes these renewal mediums necessary. The same advice applies to the artificial leather products. For mohair, as has already been stated in these columns, the whisk broom deftly used furnishes the most dependable results. The use of benzine, gasoline, naphtha, alcohol, or any other solvent, for cleaning the mohair top should be strictly prohibited.

Apply Dressing Sparingly

In coating up the leather, rubber or artificial leather top, the never to be violated rule should read: "Apply sparingly." A little of such mediums may with profit to the car owner go a long way. At the same time, some good reliable dressing material becomes a necessity in due course.

Things Worth Saving

What the car owner and user needs to appreciate is the fact that the useful life of the car depends to an important extent upon the character and quality of the top, trimming and upholstery fabrics, and the manner of promoting their wear and appearance.

Haynes Cabriolet Is An All-Weather Car

BUILT to be equally useful in all sorts of weather, the Haynes six cabriolet may be used as a coupé completely inclosed, or, at a moment's notice, changed into an open roadster. The cabriolet mounted on the model 30 chassis sells for $1,750. The body comes in light royal green finish.

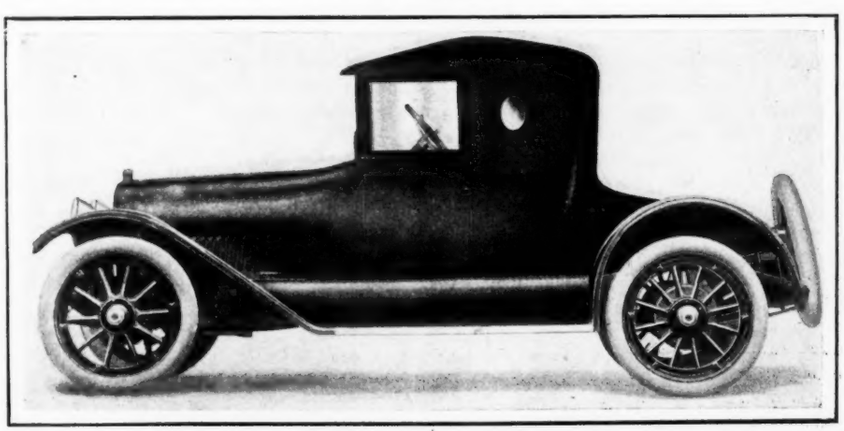
When used as a roadster the plate glass windows are dropped into recesses in the doors and the curtains are kept in a carrying space built into the back of the seat. The collapsible top is made of high grade black leather and is braced in such a manner as to stretch out all wrinkles when in the coupé position, giving a smooth, even appearance.

The transformation from roadster to coupé or vice versa may be effected in less than a minute's time by a person within the car.

The cushion is 46 inches wide and is unusually deep, and the car, although much lighter than any coupé, is remarkable for its Pullman-like riding qualities. A compartment is provided in the back of the driver's seat, out of the way and yet easily accessible, for carrying gloves, parcels and other small articles; and ample space is provided at the rear for carrying suitcases, grips, etc.

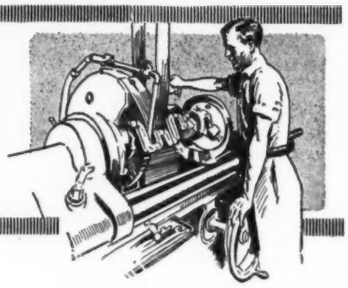
The upholstery is of the same grade black leather as the top and is deep and resilient.

A motor-driven tire pump, clear and rain vision ventilating windshield, Stewart-Warner speedometer, Firestone demountable rims, including extra spare rim, tire carrier at rear of chassis, electric horn located under the hood and operated from button at center of steering wheel, Leece-Neville electric starting and lighting separate unit system, large electric headlights with No-Glare bulbs and special dimming attachment, electric tail light, cowl light and dome lamp, 100-ampere hour storage battery, robe and foot rails, carpet on floor, and full set of tools are included in the regular equipment. A set of five Houk wire wheels is furnished for $100 extra.



New Haynes six cabriolet which, mounted on model 30 chassis, sells for $1,750

The Rostrum



This department is for the instruction of the readers and all are at liberty to ask questions. Be sure to give full name and address that we may send you a reply by letter if there is no space in the Rostrum. If you wish to sign a fictitious name, also sign your own.

Additional Treads Increase Gasoline Consumption

EDITOR THE AUTOMOBILE:—I have noted with interest the opinions expressed recently as regards the practicability of applying additional treads, or carcasses, of old shoes over casings in serviceable shape. I have not seen advanced any argument which is authoritative as to the economic principle involved and having had over 5 years' experience with tire damage and misuse and its origin, I have gained more than a fair knowledge of what is conducive and detrimental to tire longevity.

Tire resiliency is a most important factor, for the car mechanism, as well as the tires. Loss in this connection means increased gasoline consumption as the engine and its parts must function under more trying conditions. By applying an additional tread, it is most surely diminishing tire resiliency and I offer in substantiation the following examples:

Take five thin pieces of sheet metal, bend in the middle, continue a hinge-like action for several minutes. Now try a second experiment to obtain a comparison. Take ten pieces of metal similar to the above and repeat the action above mentioned. What do we find? Double the amount of energy required to produce the same degree of flexibility. A tire with an added tread is working under these latter conditions and as it must retain its normal speed, gasoline consumption is increased as well as wear and tear on the car mechanism. There is absolutely nothing illogical or theoretical in this comparison.

Second in importance is the heat occasioned by the additional opportunity for friction to develop. Under ordinary conditions there are several places for friction to occur. By adding a tread you will double this number and, therefore, increase the opportunity for development of this disastrous action. Canvas will give way from the inside first unless provoked by an injury, and its durability under abnormal conditions will unquestionably be curtailed. Instead of increasing the number of plies of canvas in a shoe, such as one would be doing by the application of an additional tread, the tendency should be towards decreasing, as the ideal tire from an all-round standpoint would be one constructed of two plies, allowing only one place for friction to develop. The cord tire as manufactured in this country today is the achievement of this tendency and is found to be highly successful for the manufacturer and economical for the car owner. There are only two plies in the carcass of this tire regardless of its size and it is the strongest and most resilient tire in use today.

New York City. JOHN C. PEPPER.

Recommends Fabric Clutch Facing

Editor THE AUTOMOBILE:—I wish to say a word with reference to clutch facings, being prompted by reading your answer to J. F. Angstad in the issue of November 12. I have replaced a leather facing with one made of fabric such as is used for brake linings and have had no clutch trouble since. The fabric was bought endless and hence was applied very easily. I find that the fabric is better than leather for the reason that oil does not injure it—in fact it works better after a little oil is squirted upon the face. With the leather clutch both water and oil of a certain kind cause poor operation.

Another thing I have found, and that is that the fabric lining wears better and holds much better although at first I had trouble with grabbing due to poor adjustment of the clutch spring. I used the fabric lining because I heard that many racing cars had abandoned the leather. I read a letter in one of the trade magazines about a Duesenberg car, which I believe was equipped with Thermoid clutch facing. Then I tried the same and got very good results. One very important feature of the fabric, I think, which you do not mention is that it does not require the care that leather needs, and I believe the fabric is the most advanced form of clutch facing.

I would like to hear what other readers have done in the matter of clutch facing.

Chicago, Ill. J. MCGOVERN.

Friction Drive Suitable for All Cars

Editor THE AUTOMOBILE:—I note that Mr. Frank A. Rice, Ithaca, N. Y., made inquiry as to whether there had been published in THE AUTOMOBILE an article on the advantages and disadvantages of the friction drive as compared with other types of transmission now more commonly used.

You state the disadvantages are that, "the friction disk must be renewed every few thousand miles. This is a small matter but worth noting." Permit us to state that since we have been using the copper alloy disk which we have now for over 4 years, that we have yet to renew a single one and we could show you many of them which have been run as high as 100,000 miles, and show practically no wear. The average

life of the friction filler is all the way from 5,000 to 20,000 miles and costs but $5.00 to replace, at retail.

You further state that the amount of horsepower that it will transmit under the conditions found in automobile design is limited, therefore, has never been used to any extent on large cars but has found favor on some cars of medium size and on more small ones. The friction transmission is just as successful in a large high-power car as on a small one. It is simply a case of building the transmission to take care of the power. One of the most successful models we ever built was a seven-passenger car having a four-cylinder motor, 4.5 by 5.25 car weighing 4,000 pounds.

Pontiac, Mich. H. R. RADFORD, Gen. Mgr. Cartercar Co.

—The statement referring to the life of the disk was slightly in error. The fiber filler in the rim of the friction wheel was the part referred to but inadvertently the word disk was used instead of the word wheel.

Three Types of Radiator Construction

Editor THE AUTOMOBILE:—What are the different types of radiator construction? Illustrate them.

2—Where could I obtain the best book for the care and repair of storage batteries, principally those used for cranking and ignition systems?

Rices Landing, Pa. A. J. SHARPNACK.

—1—There are three principal types of radiator construction, the cellular, vertical tubular and horizontal tubular. These are illustrated in Fig. 1. There are many variations under the first head. The second and third types are generally provided with fins to increase the effectiveness of the cooling.

The best example of the cellular radiator is the true honeycomb which was introduced by the Mercedes company. This is shown in Fig. 2. There are both horizontal and vertical passages in this design. There are many types that resemble this closely in principle, the only difference being in the section of the individual tube through which the air flows. One of these is illustrated in Fig. 3.

There are many radiators that look like the honeycomb, yet are not, being more like vertical tube radiators. Two of these are shown in Fig. 4. Still another type of cellular radiator is shown in Fig. 5. This is a combination of the vertical and horizontal flow designs.

2—The Electric Vehicle Hand-Book, by H. C. Cushing, Jr., and Frank W. Smith, published by H. C. Cushing, Jr., 53 Park Row, and Manual of Exide Batteries in Electric Vehicles, published by the Electric Storage Battery Co., Philadelphia, Pa., are two good books.

Operation of Electric Furnace

Editor THE AUTOMOBILE:—Can electricity be used in any way to heat a furnace, or furnish heat? If so, how? Give instances.

2—What machinery is necessary for charging storage batteries?

3—What are the objections and advantages of the friction transmission?

4—What is the price of the 1914 Cartercar?

5—What company makes the frictions used in the transmissions of this car?

6—How many Cartercar cars are in use?

7—How long has the Cartercar been manufactured?

Cooper, N. C. S. B. TEW.

—1—Whenever an electric current flows it gives off heat. The amount produced when the current flows through an ordinary wire is small because the conductor, which is generally copper, has a low resistance and therefore does not heat to any extent under the transmission of normal current but if an excessive current flows, the wire may melt. In other words the amount of heating depends on the resistance the wire offers to the flow of current, and the amount of current flowing. The resistance varies with different materials, copper and silver offering the least resistance, and also with the size of the wire. A wire with a cross-sectional area of .1 square inch will offer twice the resistance of a wire of the same material but with half the area.

Electric furnaces may be divided into two classes. Those in which the heating effect is produced by the electric arc between the electrodes which are generally made of carbon—in the spark plug, which is an electric furnace on a small scale, the electrodes are metal, and those in which the heat is produced by the passage of the current through a resistance which either forms part of the furnace proper or else is the material which is to be treated.

In the Moissan arc furnace two chalk blocks are bored out to receive a carbon crucible which incloses the center or hearth of the furnace proper. In this cavity pass two massive carbon electrodes, through openings in the walls which are held together by clamps. The arc established between the ends of the carbons when the current is turned on, plays over the center of the crucible, heating the contents.

The other type of furnace which is known as a resistance furnace may be illustrated by the Acheson furnace which is used for the manufacture of carborundum.

It is a rough firebrick structure, through the end walls of which project the electrodes consisting of composite bundles of carbon rods set in metal clamps. The space between the two electrodes is bridged by a conducting path of

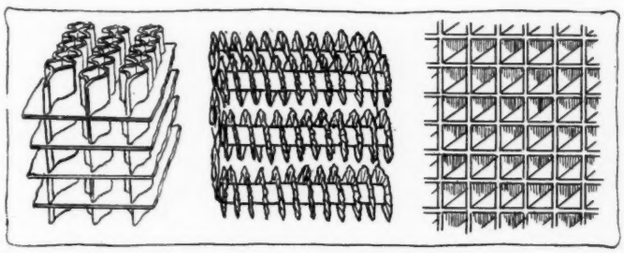


Fig. 1—Three principal types of radiator construction. At the left is the vertical tubular, in the center the horizontal tubular and at the right is the cellular

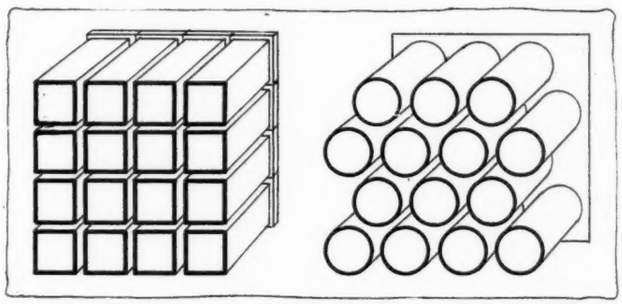


Fig. 2—Left—True honeycomb radiator. Fig. 3—Right—Radiator resembling Mercedes somewhat in principle

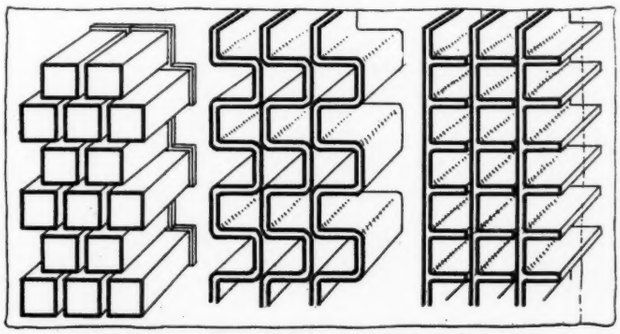


Fig. 4—Right and Center—Cellular radiators which appear to be honeycomb. Fig. 5—Left—Another cellular type

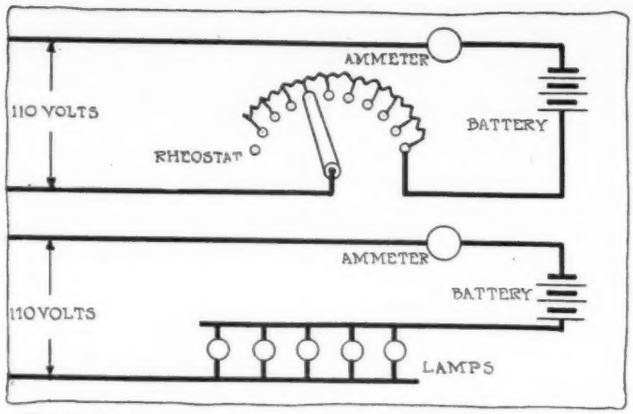


Fig. 6—Upper shows wiring diagram for charging a storage battery from direct current by the use of a rheostat. Fig. 7—The lower illustrates the use of a lamp board resistance in place of the rheostat. The resistance is varied by screwing lamps in or out

coke, which constitutes the core of the furnace. This coke is packed around with the raw material, consisting of coke, sand, sawdust and common salt.

2—The apparatus required for charging a storage battery depends on whether the current available is alternating or direct. If the latter, all that is required is an ammeter, some form of variable resistance to vary the rate of current flow, the necessary switches and wiring, and a hydrometer. If the former, a rectifier will be required to turn the current into direct, as it is obviously impossible to charge a battery with alternating current.

Fig. 6 shows the method of connecting a battery for charging on direct current. The positive of the charging line should be connected to the positive side of the battery. The rheostat is for the purpose of controlling the flow of current through the battery.

A lamp board, Fig. 7, may be used instead of the rheostat. Every lamp in circuit means decreased resistance, and increased current flow. If 110-volt lamps of 16 candlepower and carbon filaments are used, each lamp in circuit allows the passage of about .5 ampere, therefore if the charging rate were 5 amperes, ten lamps would be needed.

3—See The Rostrum for November 5 and this issue, page 1026.

4—The price of the 1914 model is $1,250.

5—Rockwood Mfg. Co., Indianapolis, Ind.

6—There are about 10,000 according to the Cartercar company.

7—The Cartercar has been actively produced since 1906, although a few cars were turned out before this time.

Gasoline Consumption High

Editor THE AUTOMOBILE:—1—I have a 1912 model 40-horsepower Michigan automobile and would like to know if it would be advisable to put radius rods and an additional torque tube on same.

2—What company made the above car, and why was it discontinued?

3—What would you suggest to lower my gas consumption? The car is equipped with a Stromberg with hot-air pipe. I have tried every possible adjustment on the carbureter with no satisfactory results.

4—About how many miles per gallon of gasoline should I get? The compression is very good and the engine runs nicely on high and low speeds.

5—What did the above car cost new? It is a five-passenger 40-horsepower, and was the car made entirely in the Michigan shops?

Brigham City, Utah. A READER.

—1—Unless you are certain that fitting a torque rod and radius rods will improve the running of the car do not do it. You do not state why you desire to make this change. If you are having trouble with spring leaves breaking, it would be better to install new leaves or complete springs, as required. This car was designed to operate properly without the use of torque or radius rods, and therefore it is likely that it will give satisfaction without the addition of these members, providing defects are corrected.

It would be difficult, if not impossible, to fit radius and torque rods so that they will work properly.

2—The Michigan Buggy Co. made this car. The company failed.

3—How do you know the carbureter is at fault? Possibly you are driving with too late a spark. Keep the spark lever advanced as far as possible at all times without allowing the motor to knock. Jack up the front wheels and note whether they turn freely. Do the same with the rear wheels with the gear lever in neutral. If any great resistance is encountered in turning the wheels, look at the bearings and also note whether the brakes are dragging. Then repeat this part of the test with the lever in gear and the clutch out. If the system turns hard there must be excessive friction in the gearset.

Make certain that you are receiving full measure when you buy your fuel and that there are no leaks in the system.

4 and 5—This information is unobtainable.

Starting on Cold Mornings

Editor THE AUTOMOBILE:—I am the owner of an Overland roadster, 1914 model, and since the cold weather has come I have experienced a little difficulty in starting in the mornings. Would it be any benefit to double the number of dry batteries so that the additional number could be switched on and off at the moments of starting? In other words, would increasing the number of dry batteries approximate a high-tension magneto and again, would increasing the number of batteries injure the coil?

Lansford, Pa. L. DOUNELLY.

—No. This would injure the coil by allowing an excessive current to flow through it. If your present cells are in good condition, they should furnish a satisfactory spark for easy starting.

The spark is probably all right but the real difficulty is due to the gasoline not vaporizing. To overcome this trouble you might use a lighter grade of gasoline, such as you can probably obtain at your drug store. Ether might also be used. Either of these fuels may be injected through the priming cups or introduced through a special priming device.

There are several devices on the market which facilitate starting on cold mornings by warming the fuel; one of these might be a good remedy for your trouble. You might also use a radiator heater to keep the motor warm at night.

Mitchell Six Motor Information

Editor THE AUTOMOBILE:—1—Who manufactures the motor that is used in the 1914 Mitchell Big-Six 4 1-4 by 7?

2—At what speed does it give its best results?

3—What is the highest speed obtained by these motors?

4—What timing should be used for speed?

5—Would the intake valves stand more than one tooth advance from its present timing? Would exhaust?

6—What is the maximum speed of the Wisconsin model K motor?

7—What ratio of weight is used in determining the weight of the crankshaft to the connecting-rods and pistons? Also the flywheel to the other masses?

8—Are the steel cylinders, like those used in De Palma's Mercedes, a difficult engineering problem, and are they very expensive castings to make?

9—What percentage of steel is used in the pistons in the racing Delages?

10—What gear ratio would be best on a 1914 Trumbull?

Manchester, N. H. R. & L.

—1—This is built completely in the Mitchell plant.

2—It gives a maximum of 72.7 horsepower at 1,300 revolutions per minute.

3—The maximum speed is 2,000 revolutions per minute.

4—Use the regular timing. If maximum speed is desired the ratio of the bevel gears should be changed from 3.357 to 2.936 to 1.

5—The timing of the intake and exhaust can be very easily advanced if so desired, although it is doubtful whether an increase of power will be noted.

6—The type K motor which is a six-cylinder, T-head design, 5.25 by 7 inches, with the cylinders cast in pairs develops about 112 horsepower at 1,400 revolutions per minute. This motor is also built as a racing design known as the KR. This model will give 175 horsepower at 2,000 revolutions per minute, it is stated.

7—There is no definite relation between the weight of the connecting-rods and the crankshaft. The crankshaft must be stiff enough to stand the stresses imposed upon it not only without breaking but without deflecting sufficiently to cause uneven wear on the bearings. Likewise the connecting-rods must be strong enough to take the piston loads without giving out.

The size of flywheel depends on the speed of the motor. A very high-speed motor that is not expected to throttle down can have a very small flywheel. Some such motors have been built with none at all.

The function of the flywheel is merely to store energy. Part of the explosive force of each power stroke is stored in it by accelerating it slightly. This energy is drawn from the flywheel later, the flywheel slowing down a small amount. On a high-speed, racing motor the impulses come so close together that there is little need to store energy for use between the power impulses.

8—The cylinders used on De Palma's latest Mercedes were very costly to make, since they were machined from individual blocks of steel.

9—The composition of these pistons is not known.

10—The stock gear ratio is probably best. In a very hilly country a somewhat lower gear might be found better, and on the other hand in a very level country, a higher gear might be more satisfactory. You must use your own judgment in this matter.

Wood Alcohol—a Good Carbon Remover

Editor THE AUTOMOBILE:—Please advise me whether you recommend the use of wood alcohol as anti-carbon treatment.

I used it twice, when the motor was very hot, using about 4 ounces per cylinder. When the car was started the next day, it smoked, had an alcohol smell but seems to run better. In my opinion it is superior to kerosene.

2—Are 4 ounces too much?

3—Does it injure any part of the motor or does it affect the oil in the base?

4—What temperature will half wood alcohol and half water stand safely in a radiator during the winter?

Fall River, Mass. E. J. D.

—1—Wood alcohol should be satisfactory. Four ounces should be enough for each cylinder. After injection of the liquid to all cylinders the motor should be cranked a few times to distribute the alcohol to all parts of the combustion chambers.

2—No.

3—No. Alcohol has no action on metals nor on lubricating oil. The only effect it would have would be to dilute the oil in the crankcase, but the alcohol in this oil would soon evaporate.

4—Thirty degrees below zero Fahrenheit. This subject was fully discussed in the Rostrum for October 15.

To Go from Los Angeles to Chicago

Editor THE AUTOMOBILE:—Can you refer me to any pamphlet or article describing a trip from Santa Fé or Los Angeles across to Chicago? Am principally interested in finding out the best summer route and condition of roads from the coast through to Omaha.

Three Rivers, Mich. CHAS. P. WHEELER.

—According to the *Automobile Blue Book* there are two main routes, Fig. 8, both of which are good in summer. One is by way of Salt Lake City and the other through Santa Fé. The former is not practicable before April 15, but the latter is open all year.

Starting from Los Angeles over the Northern route go through San Francisco, Sacramento, Reno, Winemucca, to Ogden, thence through Cheyenne, to Omaha. The Southern route lies through Needles, Flagstaff, Springerville, Santa Fé, La Juanita, Hutchinson, Kansas City, St. Joseph, Omaha. An alternative route through from Los Angeles is by way of San Diego, Yuma, Phoenix, Springerville. The parts of the road which are indicated by the full black line are good. The Northern route follows the Lincoln Highway from Salt Lake City to Omaha. From Omaha, go to Chicago by way of Des Moines and Clinton.

Fan Flywheel Requires Small Clutch

Editor THE AUTOMOBILE:—Would you kindly explain why the fan for cooling is not made integral with the flywheel on cars having the transmission combined with the rear axles?

During the last 3 years I have driven a car having the fan integral with the flywheel and have not found anything wrong with the cooling system.

2—Was this system of cooling used on Mercedes cars? If so, to what extent?

Cleveland, O. T. J. MILLER.

—1—First of all the flywheel type of fan does not produce as rapid a circulation of air as the ordinary type just behind the radiator. Second, even with the gearset on the rear axle it might not be possible to use a fan flywheel. This type of flywheel, when at the rear, requires that the clutch be very small, in other words a multiple-disk clutch of small diameter or a clutch of the original Mercedes type must be used. A cone clutch, expanding band or large-diameter, dry-plate can not be used.

In other words less is required of the radiator. It may be smaller, the water circulation and pump speed slower or a less effective radiator may be used.

2—This method of air circulation has always been used on Mercedes cars.

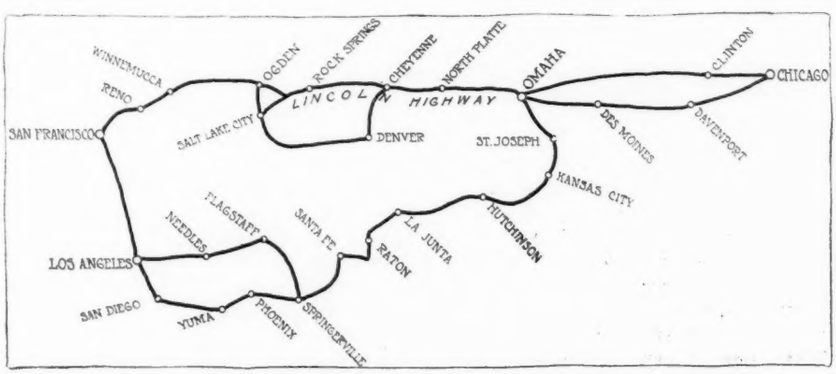


Fig. 8—Map showing best routes between Los Angeles and Chicago

Trucks and the Traffic Engineer

Motor Truck Is a Hauling Machine Built to Compete with the Horse-Drawn Vehicle and to Be Sold to Business Men as an Investment

THE traffic engineer is the efficiency doctor of motor truck selling, and motor truck operating. A motor truck is a machine designed and built in a variety of sizes for hauling materials, its chief competitor being the horse-drawn vehicle. The motor truck has a high first cost and is bought by business men as an investment.

The Sales Problem

Now here you have the entire sales problem boiled down into one statement. A motor truck is a hauling machine which is to compete with the horse-drawn vehicle, and which is to be sold to business men as an investment.

Handling the Customer

We know the sales problem—how are we going to solve it?

The first step in selling any machine to a business man is to reach him and interest him. How is this to be done? It can be done in two ways:

First.—By proper advertising.

Second.—By supplying dealers and their salesmen with reliable, accurate, and undisputable data, carefully collected from all the various lines of business which the truck is designed to fit.

Real Advertising

By proper advertising is not meant advertising the chemical properties of your springs and axles for the horsepower, bore and stroke of the motor, but it means advertising the service value of the truck and the economies to be affected by its installation.

Here is where the traffic department must start. It must collect the data which should form a basis for all advertising and furnish the dealer and his salesmen with the ammunition which should not only interest the prospective buyer but make him ask for an investigation of his own delivery equipment.

Trucks Are Profitable

After we have reached and interested a customer what is the next step in selling a machine? The next step naturally is to show him that it will be a profitable investment for him to buy. This can only be accomplished after the salesman knows such facts as:

What is the present equipment doing?

What does it cost to operate and maintain it?

Editor's Note—At the recent convention of motor truck makers and dealers held in Detroit, Mich., by the Motor Truck Club of America, the question of traffic engineering was one of the most pertinent topics. One of the best suggestions on traffic engineering was that of having each truck company open a school on traffic engineering for the benefit of its dealers and their salesmen. The school would partake of a series of correspondence courses between the factory and the dealer, and the dealer in turn could use whatever means he desired for getting the information to his sales force. This plan was suggested by E. L. Shumacher, traffic engineer of the Denby Motor Truck Co., Detroit, Mich.

Can it be improved in any way?

What can the motor truck do operating under these conditions?

What will it cost to operate and maintain trucks working under these conditions?

The Salesman Expert

Such facts can only be learned after a thorough investigation has been made. A very large percentage of firms think they know what their delivery equipment is doing and what it costs, but actually a very small percentage knows, hence a motor truck salesman must be a transportation man, capable of analyzing conditions, comparing costs, accurately figuring savings and correctly advising the proper installations. In other words he must fit trucks to the business and not permit the business to be fitted to the truck.

Business Methods Needed

Merely going into a prospective customer and telling him he can replace three teams with one truck and save money because one of his competitors did so, is ridiculous and won't serve much longer. Why I have recently investigated two similar lines of business and found the cost per mile of operating the same kind of wagons doing the same class of work to vary over 100 per cent.

It is suicidal to the truck industry to sell trucks predicting savings on this information. The conditions under which deliveries are made, the efficiency of operating the equipment all vary so widely that it is impossible to accurately compare costs, calculate savings, or advise installation without a thorough investigation. And eventually the truck salesmen must be able to make these investigations for it is only after such investigations that business men can be shown that a motor truck is a profitable investment.

Know Your Truck

After the average business man has been interested in a machine and convinced that it will be a good investment there is still one point he must be convinced of. He must be convinced there is no better machine on the market from the standpoint of price, adaptability and economy.

Here again it is up to the salesman and he must know his product. This does not mean he must talk transmission, magneto or wheels, but it does mean that the buyer must be convinced that the cost per mile of operating and maintaining the proposed truck will be a minimum and that it will be the proper capacity and design for his particular requirements.

Competent Salesmen

This is nothing new in selling machines. I don't believe there is one type of machine excepting the motor truck which is not sold as just described. Take for example the gas producer, steam engine, locomotive machine tool, before any one of them can be sold the purchaser must be shown:

1—That he needs one.

2—That it will be a profitable investment.

3—There is no more profitable machine on the market.

Can you imagine a salesman selling steam engines without being so schooled in his product that he could not figure the cost per b.h.p. or the saving to be effected by replacing an older or less efficient equipment?

Can you imagine a gas producer salesman unable to accurately predict the quantity and B.t.u. value of the gas produced together with the savings it should effect over the installations?

Can you imagine tool salesmen unable to predict the advantages and exact performances of his milling machines or lathes? And the savings to be effected by this installation?

And likewise in the near future you will be unable to imagine a motor truck salesman unschooled in transportation analysis, costs and economies. Furthermore there is not one of the above named machines which is not sold along the same lines as trucks are being sold.

Now you will say, "What is it going to cost to sell trucks, under this plan?" and in answer, I will say, "the selling expense per car will be less, and the number of sales should very quickly double and treble."

You will then most probably ask, "Where are we to get salesmen capable of making these investigations, etc.?" and in answer I will say here is where the traffic engineering department comes in again. It does not take any more intelligent or higher grade salesman.

With a little schooling and coaching your present salesmen can all be supplied with the proper data and training and shown how easily they can make these investigations, and it should be one of the most important duties of the traffic department to help in this development.

Fooling Yourself

There is one other point in connection with motor truck selling which I wish to touch upon and that is "fooling the customer." Motor truck salesmen must realize that it is the truck buyer and not the manufacturer who pays their bills. Just as soon as they realize this they will have the backbone to advise him not to buy if it will be unprofitable, and the foresight to see that a sale made which will not be satisfactory to the customer will most probably spoil the chances for making a dozen or more similar sales, for one dissatisfied owner will do more harm to future business than a dozen satisfied owners can do good.

With the exception of motor truck selling I believe that motor truck operating offers the greatest field for advancing the motor truck industry quickly. This advancement will be made along three distinct lines:

1—By waging an educational campaign for truck owners and operators. This is being done at the present time by getting the truck owners and operators together once a month. At these meetings there is generally a couple of educational papers presented and the operators exchange their experiences and get light on their troubles.

2—By injecting efficiency into delivery equipments and methods. Deliveries have been considered necessary evils and have been run in a haphazard way. Very few are run economically. In some cases little things such as changing routings, or lengthening loading platforms will save considerable time and money. The salesman when making his investigation should be quick to detect such defects. There is no quicker or better way of convincing a firm that you know hauling problems.

3—By the development of time saving appliances such as quick loading and unloading devices, specially designed bodies, etc. It is in this direction and not in motor truck design that the opportunity for effecting large savings is offered. There undoubtedly will be many thousands of dollars saved in this direction.

This work naturally is one of the chief duties of the traffic engineering department and should do much in advancing the economies to be effected in motor truck operation.

Three Ideas

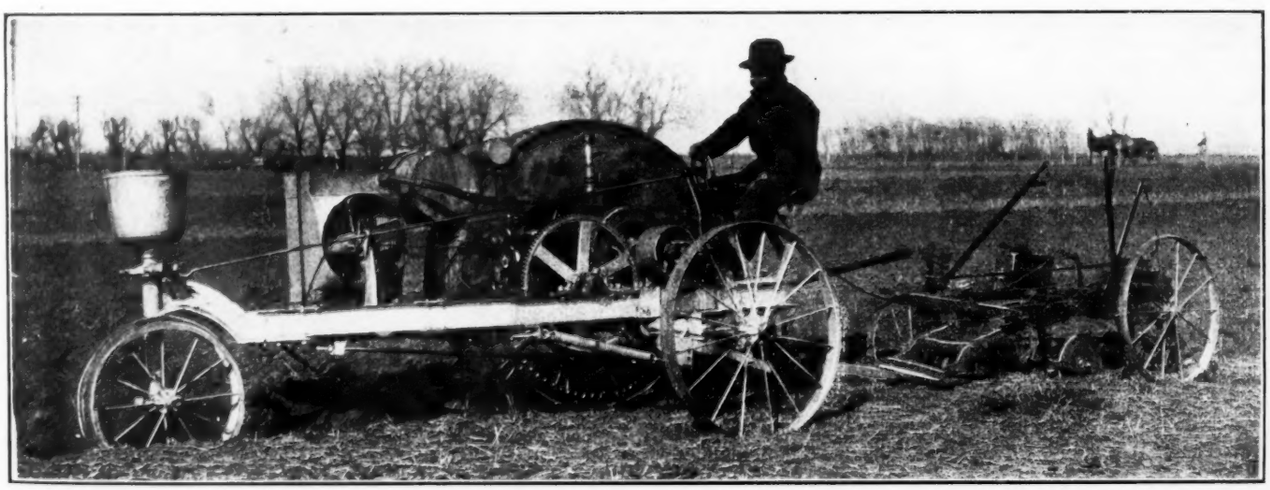
In conclusion I would simply like to add that any traffic engineering department if it ever expects to be a success or accomplish results, must bear in mind three things:

1—That every truck owner must be a satisfied owner.

2—That every dealer must make money.

3—That to accomplish 1 and 2 the traffic department and the dealer must work hand in hand to not only sell more trucks but to also sell them better.

Bull $335 Farm Tractor Does Work of Five Horses

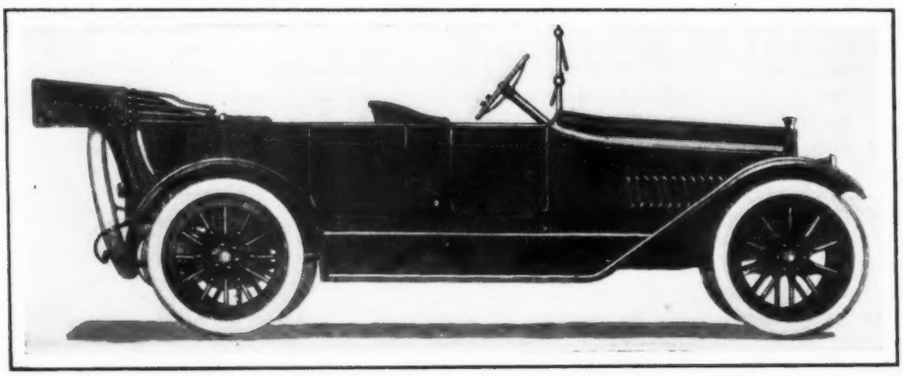


THE Bull Tractor Co., of Minneapolis, Minn., is manufacturing a farm tractor for $335 that is capable of pulling two 14-inch stubble plows or their equivalent in any other work on the farm. The tractor, which is shown in the accompanying illustration at work with a plow, employs a two-cylinder, four-cycle opposed motor having a bore of 4.75 and a stroke of 6.5 inches. It operates at from 750 to 800 revolutions per minute and delivers 5 horsepower to the draw-bar and 12 horsepower at the belt. It is 12 feet overall, 5 feet 4 inches high and 6 feet 6 inches wide. It operates on gasoline or Motor Spirit and the makers claim for it an average fuel consumption of 1.75 gallons per acre.

The Bull Tractor Co., estimates that the tractor is able to do the work of five good horses and for that reason represents a considerable saving of money to the farmer employing it. It is operated by one man who is seated on it and who guides it by means of the 28 inch front wheel which serves the double purpose of supporting the frame and at the same time automatically following the furrow for guidance in plowing. In other work it steers the same as an automobile.

CHICAGO, ILL., Nov. 27—The Illinois Public Utilities Commission has granted a license to the Chicago Automobile Transportation Co. which will launch Chicago's first boulevard motor bus line. The company expects to operate 150 cars. Four other motor bus companies have applied to the commission for licenses.

Kline Adopts Unit Power Plant



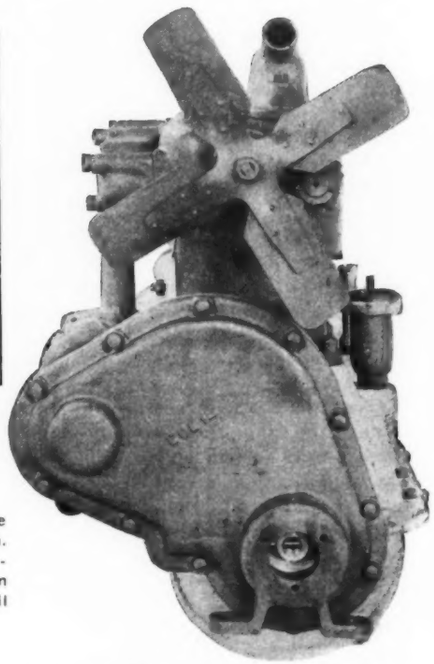
Touring body fitted to the six-cylinder Kline car for the 1915 season

Five Bodies on Two Chassis Similar Except Wheelbase—Change to Three Speeds

TWO chassis which are practically the same in every detail with the exception of the wheelbase will compose the line of the Kline Motor Car Corp., Richmond, Va., for the coming season. These chassis which are known respectively as 6-42 and 6-42A embody a six-cylinder motor which differs from previous Kline practice in that it is a unit power plant instead of the separate engine and amidship gearset as previously used. The cylinder castings on the new car are now a one-piece block instead of the separable block as in former practice. Last year Kline cars had their cylinders cast in pairs with the ends machined and bolted together.

New L-Head Motor

The new motor is an L-head which is not altogether new for the company as in a four previously manufactured it was employed, although the T-head has been used on the previous larger models. The three-point suspension heretofore employed has been changed. The pivot point was formerly at the flywheel but has now been changed to the front on account of the change to the unit power plant. The radiator suspension has been changed from the main side members to studs placed in the bottom of the radiator and bolted to a cross-member. This change was made on account of relieving the strain on the radiator, due to the twisting of the side members. In practice the company has found that the new suspension works out better as regards the elimination of strains on the radiator structure.

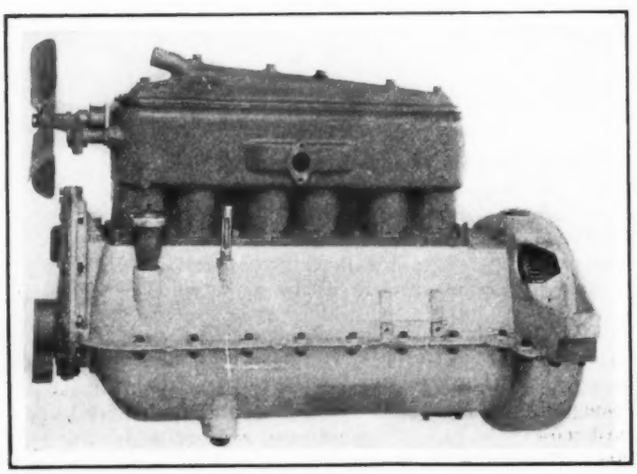


Front end of the new 3.5 by 5.125-in. power plant, showing mounting of fan and crankcase oil filler

The four-speed gearset formerly used, which was direct on third and geared up on fourth, has been replaced by a three-speed type. The reasons advanced for this change is that the new motor is more flexible and more powerful than the old and the direct drive on high is quieter than the overgeared drive. It has been found, according to the company's engineer, that a speed of from 3 to 58 miles per hour can be obtained with the regular gear ratio of 3.75 to 1.

The electric starting motor has been changed to the left side of the engine above the frame line and bolted directly to the crankcase. This change has enabled the designers to completely inclose the Bendix gear by means of which engagement with the flywheel is effected, providing a more dirtproof construction and at the same time silencing the engagement. The former mounting was on the right side of the motor below the line of connection to the frame and in muddy weather it was found difficult to keep the dirt from entering between the pinion and the teeth on the flywheel.

The lighting generator is now located on the right, next to the water pump, and is driven by the pump-shaft at 1.5 crankshaft speed. The former mounting was on the frame next to the gearbox and a silent chain drive was taken from a gear from the rear end of the gearset shaft. The generator has been decreased in speed by the difference in ratio of the former 3 to 1 and the new 1.5 to 1.



Left side of the six-cylinder L-head Kline motor

Vacuum Fuel Feed

A change in the gasoline system has been effected by placing the 20-gallon tank at the rear of the chassis and feeding by means of the Stewart-Vacuum system which carries the gasoline from the rear tank to a small tank on the side of the dash next to the motor and from there to the carbureter

by gravity. Formerly there was a gasoline tank under the seat and a gravity system was used. By the new system it has been possible to shorten the intake manifold, which has resulted in more advantageous carburetion and a more accessible carbureter. There is a gain by this of 3 gallons in the capacity of the gasoline tank.

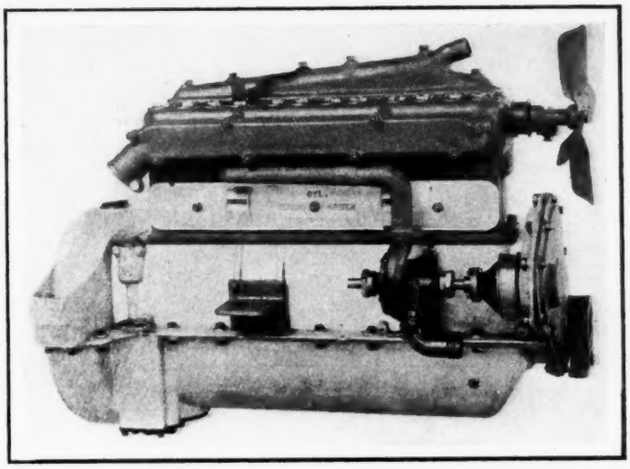
12 Per Cent. Lighter

A streamline body completes the list of innovations for the Kline car of 1915. It has a rounded radiator and hood, oval mud guards, built-in windshield, low, long body lines, deep upholstery and an up-to-date appearance throughout. The weight has been decreased more than 12 per cent. according to the Kline company, by using the unit power plant construction eliminating the sodpan, lighter body, top, rims, tire irons, etc., and by the fitting of narrower drip-pans between the motor base and frame.

The cylinders are 3.5 by 5.125 inches and have the valves on the right. The manifolds are formed with the intake integral with the cylinder casting and the exhaust separate. Cooling is accomplished by a centrifugal pump which circulates the water through ample water jackets and a cellular radiator.

Lubrication is taken care of by a combination pressure and splash system. The oil is forced by pump to the main bearings and thence flows to the splash trough, whence it is splashed to the cylinders and other bearings within the motor.

The entire electric equipment with the exception of the storage battery is taken care of by the Westinghouse company. The battery is a Willard. The system works at 6 volts and provides a dual-ignition system together with lighting and starting. The battery capacity is 130 ampere-hours at 6 volts.



Right side of Kline six-cylinder power plant

The clutch is a dry disk located in the flywheel with the driving surfaces engaging against asbestos and copper lining. The power is delivered to a three-speed gearbox which on direct provides a reduction of 3.75 to 1. Final drive is by spiral bevel and propulsion is through the springs. The rear axle is three-quarter floating. Thirty-four by 4 tires and a 123-inch wheelbase are found on the 6-42 chassis upon which are mounted a touring, toy tonneau or roadster body, while on the 6-42A chassis the wheelbase is 127 inches, the tires are 35 by 4 1-2 and the bodies are a seven-passenger touring and a seven-passenger limousine. The prices of the bodies on the 6-42 are $1,750. On the 6-42A, the touring is $1,850 and the limousine $2,850.

Completeness Features Moline-Knight Closed Cars

COMPLETENESS and luxury are the keynotes of the two closed cars recently brought out by the Moline Automobile Co., Inc., East Moline, Ill. They are a seven-passenger limousine and a five-passenger sedan mounted on the 50-horsepower Moline-Knight chassis. Three speed gearbox is standard, though a four-speed type may be furnished. Wheelbase is 128 inches for both cars and 36 by 4 1-2-inch tires are used. The limousine sells for $3,800 fully equipped and the sedan for $3,250 with wood wheels and for $3,340 with wire wheels.

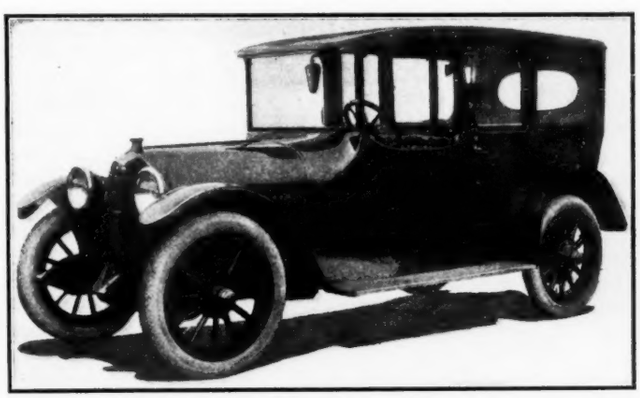
The tonneau of the limousine is trimmed with medium gray whipcord while the front seats are finished with hand buffed, long grain, black enamel leather. The body is painted blue above the panels and black beneath.

The window ledges are finished with aluminum drip molding and there are aluminum door moldings and nickel fence rails. The roof is three-ply veneered wood and the top over the driver's seat is painted black. The rear doors are hung with concealed upper hinges and the lower hinges are exposed covered joint types. The front door hinges are concealed. Equipment is complete.

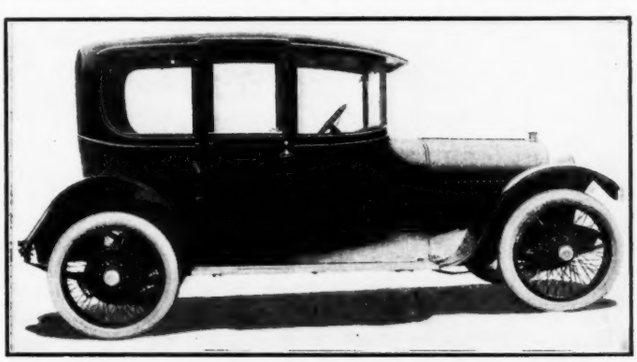
Removable auxiliary seats face forward and are arranged so that they may be folded against the side of the body or placed in sockets on the division when not in use.

Doors and windows are prevented from rattling by bumpers or antirattlers, and a pair of pillar lamps are so arranged that the light will be thrown on the running board.

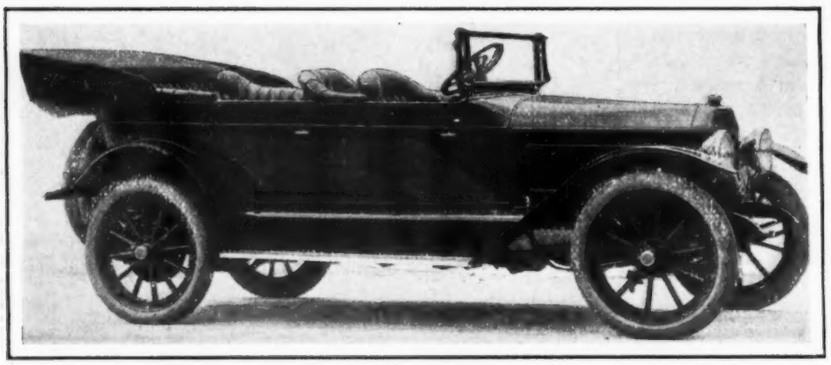
The general make-up of the sedan is similar to that of the limousine. A dark gray whipcord upholstering is used in place of the lighter gray in the limousine. All panels are of 22 gauge cold rolled automobile body steel with joints either welded or covered with aluminum molding. Equipment is similar to that of the limousine.



Moline-Knight limousine, which sells, completely equipped, for $3,800



Sedan at $3,250, with wood wheels, and at $3,340, with wire wheels



Five-passenger, six-cylinder Peerless touring car with individual front seats and selling for $2,250

New Peerless Four, $2,000—Six at $2,250

Block-Cast Unit Power Plants of Similar Design and Largely Similar Dimensions Used in Both Models

IN bringing out its two lighter and lower-priced cars, which have been styled all-purpose models, the Peerless Motor Car Co., Cleveland, O., has produced a type of machine new to its factory. Heretofore only big cars of the $5,000 and $6,000 class have borne the Peerless name, and the striking part of the move is that the new models 54 and 55, the latter a six, are none the less distinctive in appearance and finish or carefully designed than are the larger cars on the 48-six chassis. In the open models, the new four sells for $2,000, and the six for $2,250.

Block Cast Unit Power Plants

The motors, with the same dimensions wherever possible, are consistently alike in construction. They are block-cast unit power plants with L-head cylinders. Other chassis specifications include left drive and center control, open driveshafts with two universals, disk clutch, semifloating rear axle, 34 by 4 tires on all models, Gray & Davis cranking and lighting, Atwater Kent ignition, Stromberg carbureter, Stewart vacuum gasoline feed from tank at the rear of the chassis, and drive through platform rear springs.

A special point is made of the short wheelbase—113 inches for the four and 121 for the six. By saving space at points which would not affect the comfort or convenience of the passengers, this has been accomplished. Credit is due the engineers for this wheelbase shortness, when the roominess of the bodies is considered. The open bodies are interchangeable on the two chassis, and have a distance from the dash to the front edge of the rear seat of 74 inches, and from the dash to front seat of 23 1-2 inches.

Individual Front Seats

Both the bodies and the chassis are practically identical, such differences in dimensions as are to be found being incident to the longer motor of the six. A feature of the touring body is the use of individual front seats, these providing a passage way from front compartment to tonneau. The arrangement aids in the ventilation of the front compartment and makes it easy to manipulate the one-man top.

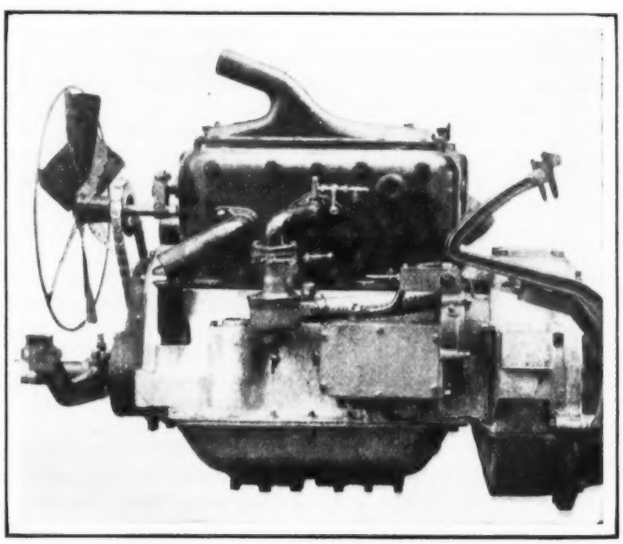
Other than the differences due to the two additional cylinders, there are only two dimensional items not alike in four and six engines. These are the bore and the valve diameter. The four is a 3 3-4 by 5 motor, and the six a 3 1-2 by 5. The former has 1 7-8 valve diameter and the latter 1 11-16. Despite the fact that the S. A. E. formula, which is based upon 1,000 feet per minute piston speed, accords the four 22.5 horsepower and the six 29.4 horsepower, the former develops 38 and the latter 50, they reaching their highest efficiency at 2,000 revolutions per minute, which is a piston speed of about 1,666 feet per minute with this stroke of 5 inches. The piston displacement of the six is 288.6 cubic inches and of the four, 220.92 cubic inches.

The general arrangement of the motors places most of the external fittings on the right side. Valves are all on this side, as well as the exhaust manifold with individual opening to each cylinder. The generator shaft is here also. It drives a centrifugal water pump on the six, the four having thermo-syphon cooling. On this shaft there is also a gear for driving the single-cylinder Kellogg tire pump.

On the left are only two parts, the Stromberg carbureter and the cranking motor which gears to the flywheel. There is no external intake manifolding, the distribution of the gases to the several intake ports being through cored passages within the cylinder casting. Only a single opening in the center of the block communicates with the carbureter through the intermediary of a short L tube. The fan has adjustable belt drive at the front end.

On these motors, crankcase and oil pan are separate; the former is an aluminum casting. The latter is made of pressed steel, thus saving several pounds in weight over cast aluminum. All bearings are carried in the crankcase and are accessible after the oil pan is removed.

The pistons cast from the same grade of metal as used in the cylinders carry three, diagonally-split, eccentric, expansion rings which, having gone through a special machining process which relieves all strains, are ground. Oil grooves

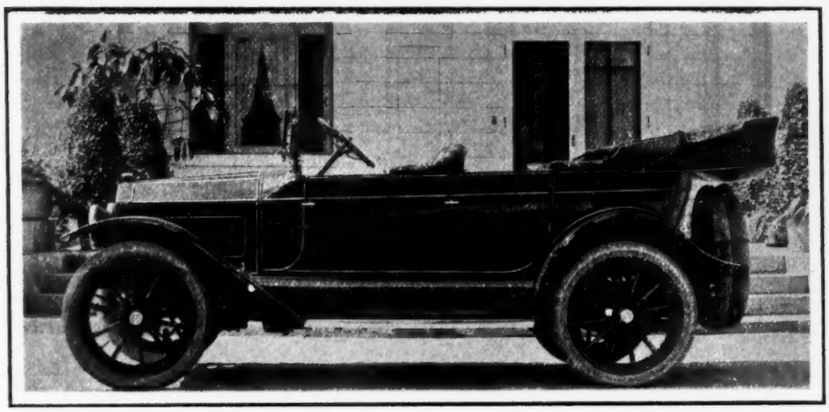


Left side new Peerless four motor, showing mounting of carbureter

are turned on the outside of the piston for distributing the oil splash over the cylinder walls, yet special provision is made to prevent excessive amount of oil reaching the combustion chamber.

The piston pin is of special steel tubing, hardened and ground to size, is held stationary in the piston bosses by a locking device and has its bearing in a large bronze bushing which is pressed into the connecting-rod. Ample lubrication is obtained through an opening in the upper end of the connecting-rod in which oil from the splash is trapped.

Connecting-rods are I-beam .35 carbon steel, drop-forged and heat-treated. The crankshafts of both motors are three-bearing types with well proportioned and liberal sized bearings. It is made of a special crankshaft steel, drop-forged and heat-treated, giving a tensile strength of 90,000 pounds per square inch. Flanges are provided on both ends of the center bearing to take any end thrust which may be imparted from the clutch or other source.



Peerless all-purpose four-cylinder touring car listed at $2,000

The camshaft is drop-forged from a single piece of low carbon steel, the cams being integral with the shaft, which runs on three large, white bronze bearings, lubricated from oil pockets cast in the crankcase for this purpose. The camshaft may be readily withdrawn after removing the gearcase cover.

The crankshaft bearings and connecting-rod bearings are made of nickel babbitt, backed with bronze and held in place by brass retaining screws. Bearing adjustment is secured by means of a number of punched sheet steel shims varying in thickness from .002 inch to 1-16 inch.

Valves Are Interchangeable

Inlet and exhaust valves are interchangeable and have nickel steel heads electrically welded to carbon steel stems. The clearance around the valve heads is so proportioned as to attain the best efficiency, and the ends of all the valve stems are hardened to insure against wear from the tappet action. The removable metal plates which cover the valves not only keep them free from dirt, but also tend to quiet the motor.

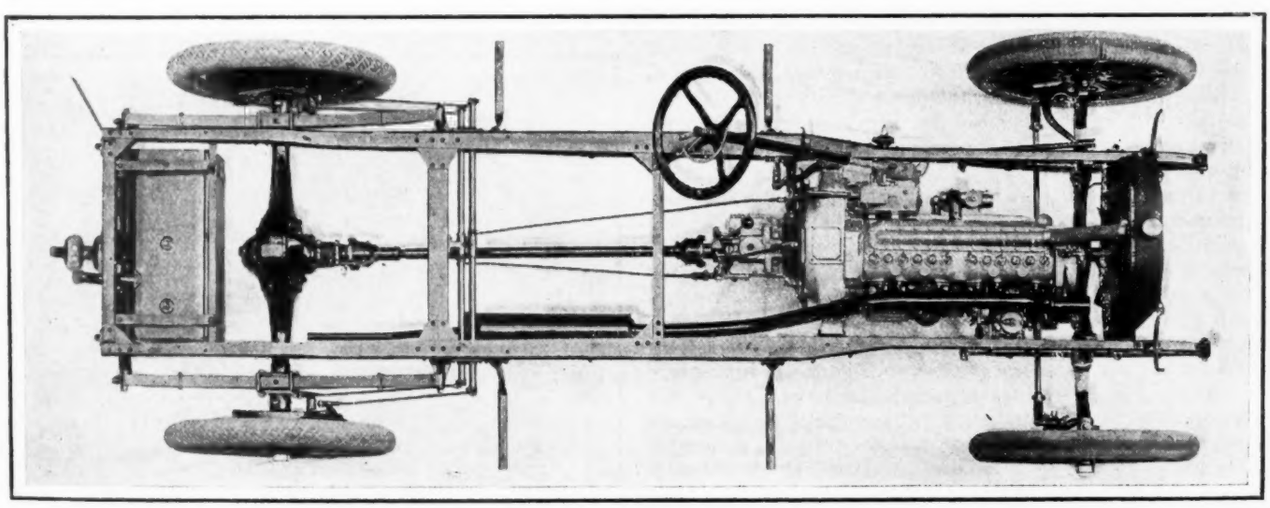
Both the four and six-cylinder motors have a combination force feed and splash system of lubrication. A horizontal plunger pump driven by an eccentric on the camshaft forces oil through copper tubes direct to the timing gears and main bearings. It then drains back into the oil troughs, thus maintaining a level for the splash lubrication of pistons, connecting-rods and other bearings. From the oil troughs it overflows into the oil pan, passes through a filter which removes any foreign particles and is again picked up by the pump.

Timing gears are helically cut and in order to secure best results, particular attention has been paid to the maintenance of accurate gear centers. Each set is housed in the usual gear case on the front of the motor.

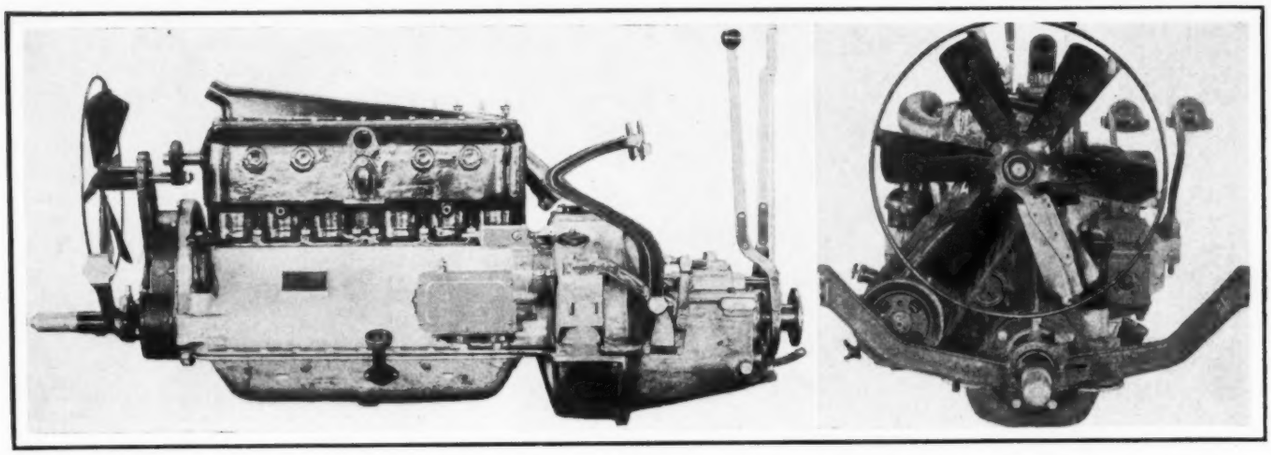
Vacuum Fuel Feed

Gasoline is supplied from a 20-gallon tank at rear of car to the carbureter through Stewart vacuum feed system. The upper chamber of the gravity tank on the dash receives fuel drawn up from the main tank due to action of vacuum in the inlet manifold. When the upper chamber becomes filled, the contents are automatically discharged into the lower reservoir, whence gasoline flows by gravity directly to the carbureter. This system does away with the pumps, gauges and filters necessary on the older pressure feed systems and makes an especially neat installation on small and medium sized motors.

Ignition is provided by the Atwater Kent Unisparker which receives current at 7.5 volts from dry cells for cold weather starting, and 6 volts from storage battery for regular running. The dash switch is of unique design which automatically provides for frequent reversal in direction of primary current through the interrupter, thus lengthening the life of the contacts. Interrupter, distributer and governor providing automatic advance, are combined in a com-



Peerless six chassis, showing block motor, left drive, center control, main fuel tank at rear and platform spring



Left—Intake side of new six-cylinder Peerless power plant. Right—Front view of motor, showing pivot support for front end

pact unit positively driven from the shaft of the lighting generator. Open wiring is employed, the high tension leads to spark plugs being carried on fiber block insulators to insure protection against leakage or grounds.

Single Wire Lighting

The lighting system is a single wire type using Gray & Davis 6-volt generator. The generator is mounted on a bracket at the right side of the motor and is driven through a leather disk coupling on the gear-driven shaft. The generator also is arranged to carry and drive the igniter unit.

The generator is a variable-speed, shunt-wound type T machine with cut-out coil and two-point voltage regulator mounted thereon. The shunt winding of the coil causes the generator to cut into the lamp and battery circuit at 600 revolutions per minute. Voltage is then regulated against effects of fluctuations in engine speed by means of the two-point regulator which automatically inserts or cuts out resistance from the two generator shunt field windings. A main cut-out acts also as protection for the generator against possible reverse currents from the storage battery.

No Side Lamps Needed

Head and service lamps are combined and provided with two bulbs, one of 15 candlepower for country driving and the other of 4 candlepower, and out of focus, for city driving. The storage battery is a 6-volt 80-ampere-hour Willard, common to both lighting and starting systems and interchangeable on models 54 and 55. Dry cells are provided for emergency ignition.

The cranking unit is a Gray & Davis type Y, series wound, motor, mounted on a bracket at the left side of the engine and driven through a self-contained countershaft and pinion, meshing with a ring gear on the flywheel only when starting. The operation of starting consists in pulling a knob on the instrument board which transmits force through leverage and a helical spring to the sliding pinion on the countershaft. The helical spring causes meshing the instant the pinion begins to turn over.

The electric motor gives a breakway torque at the crankshaft of approximately 285 foot pounds. It will spin the engine at 125 revolutions per minute with a current consumption of 70 amperes, which speed is so high as to insure easy starting of the engine in all weather, it is said.

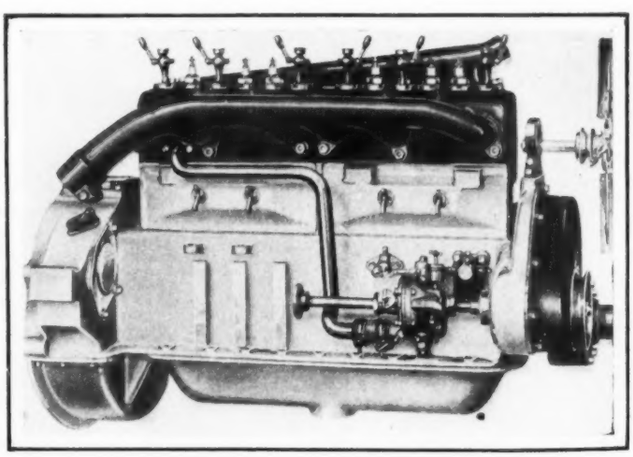
Clutch and change-speed gearset are assembled in a single transmission unit with case bolted directly to motor bell housing. All moving parts are protected by the aluminum case and are accessible for inspection through removable plate and cover. The units are interchangeable on models 54 and 55.

The clutch is of the multiple-disk type and controlled by pedal through ball bearing thrust, a special lever design providing easy clutch action and pedal adjustment. Inside clutch plates are 3-32-inch stock hardened and ground. Outside plates are cold rolled steel covered with asbestos friction surface and driven by twelve case-hardened keys, riveted to the pressed-steel clutch driving-drum.

The gearset is a sliding, selective, with three speeds forward and one reverse. Gears are 6—8 pitch with wide face, and are of 3 1-2 per cent. nickel .20 carbon steel, heat-treated and carbonized. Other features are a square driveshaft of .80 carbon, crucible tool-steel, tempered; Timken roller bearings on mainshaft; S. R. B. ball bearings on countershaft; die-cast, babbitt pilot bearing and special ball thrust bearing between front and rear members of the mainshaft.

Universal joints are provided at both ends of the open propeller shaft. These joints are packed in grease and oil, and are protected from leakage and dust by sheet metal boots. The propeller shaft is integral with the universal joint member at the rear axle end, while at the gearcase end it has a fluted sliding joint, thus providing for movement of the rear axle on rough roads. The propeller shaft center is of steel tubing.

The rear axle is semi-floating, with the main housing of reinforced pressed steel with pressed steel rear cover. The differential and pinion shaft form a unit with the front cover, thus insuring alignment, yet giving commendable accessibility. The pinion shaft and differential are each carried on two taper roller bearings which care for both the radial and thrust loads. The pinion is of 3 1-2 per cent. nickel steel and the gear is of nickel-chrome steel. They are of the helical bevel type which insures quiet running. Live axles are of



Exhaust side of six, showing cover plates inclosing valves, etc.

1 1-2-inch nickel-chrome steel provided with single taper roller bearings near the outer ends to take the wheel load.

Easy Brake Adjustment

There are the usual two sets of hub brakes. The foot or service brakes are of the contracting-band type while hand brakes are of the expanding-shoe type. Both are provided with asbestos friction lining. Adjustment of service brakes is made simple through the use of wing nuts.

The new cars have a pressed steel frame of 4-inch channel section, dropped at the rear and inswept at the front. Frames of both models are of the same general design, but the dimension from dash to front end is 8 inches longer on Model 55. The frame is trussed to give maximum stiffness with minimum weight.

Platform type of rear spring suspension, which has been featured on former Peerless cars, is continued on Models 54 and 55. Lightness and simplicity of chassis are furthered in these smaller models by eliminating radius rods and using the rear side springs to take the drive from rear axle to frame. They also take the torque reaction, thus permitting the omission of a separate torque member.

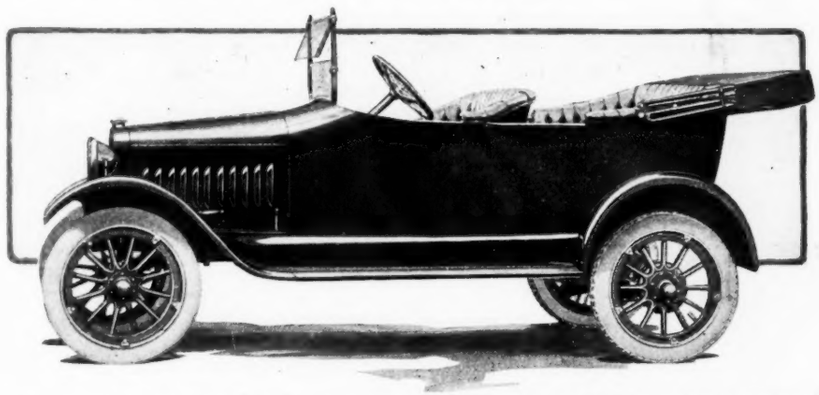
Data on New Peerless Motors

	FOUR	SIX
Firing order	1-3-4-2	1-5-3-6-2-4
Valve diameter (inlet and exhaust)	1 7-8 inches	1 11-16 inches
Valve lift (inlet and exhaust)	3-8 inch	3-8 inch
Diameter of flywheel	15 inches	15 inches
Crankshaft front bearing	2 3-16 by 2 7-8	2 3-16 by 2 7-8
Crankshaft center bearing	2 7-32 by 2 1-2	2 7-32 by 2 1-2
Crankshaft rear bearing	2 1-4 by 3	2 1-4 by 3
Camshaft front bearing	2 19-32 by 1 1-2	2 19-32 by 1 1-2
Camshaft center bearing	2 5-8 by 1 1-8	2 5-8 by 1 1-8
Camshaft rear bearing	1 1-2 by 1 3-4	1 1-2 by 1 3-4
Connecting-rod bearing	1 7-8 by 2 3-16	1 7-8 by 2 3-16
Connecting-rod length	10 1-4	10 1-4

Saxon Six To Sell for $785

FOLLOWING up its success in the field of low-priced fours the Saxon Motor Co., Detroit, Mich., has joined the move for really low-priced sixes. Bringing out a car with a power plant of this type for $785 is the newest development offered by this Detroit concern.

To take care of the added production facilities necessary in marketing the low-priced four and six-cylinder cars, as reported elsewhere in this issue, the company will take over the building formerly occupied by the Abbott Motor Car Co., in Detroit. The output of the four will be increased and the Saxon company states that the price of the six is based upon an output of 25,000 cars.



Five-passenger, six-cylinder Saxon touring car, which sells for $785, completely equipped

The new model is fully equipped and mounted on a 112-inch wheelbase and uses 32 by 3 1-2 tires. It has a five-passenger capacity. The tread is standard 56 or optional 60-inch width. The motor has its six L-head 2 7-8 by 4 1-2-inch cylinders cast in a block. The valve action is inclosed by cover plates and the valves are of nickel steel with carbon-steel stems.

A drop-forged steel crankshaft of 1.875 inches in diameter carried on three main bearings is used. The camshaft is also a drop forging of 1-inch diameter and is carried on four bearings. The cams are integral with the shaft which is driven by helical gears.

Thermo-Syphon Cooling

Oiling is by splash to the cylinders but by pressure to the main bearings, the circulating pump taking the oil from the crankcase to these bearings and from this point a gravity flow carries the oil into the splash trough. The oil is carried through a strainer before again reaching the pump to be re-circulated. Cooling is by thermo-syphon with a cellular radiator and fan.

Ignition is by the Atwater Kent system which provides either automatic or hand control. Gasoline is fed by gravity from the 10-gallon tank located in the cowl.

Power is taken from the motor by a multiple disk dry-plate clutch with steel against Raybestos bearing surfaces. The gearset provides three speeds forward and is mounted on the rear axle being carried on Hyatt roller bearings with ball thrust. The driven pinion gear is adjustable and the shafts are all of nickel-steel. The shaft connecting the clutch and gearbox is of solid alloy steel 1-inch in diameter with two universal joints and with a concentric torque tube.

Two sets of brakes are used on the car, both of which are on the rear wheels. The service brake is external contracting, 10 inches in diameter with a 2-inch space. The emergency is internal expanding having a diameter of 9.75 inches and a face width of 2 inches. Both these brakes are lined with Thermoid. The steering gear is a worm and full gear with a 17-inch wheel. The steering connections throughout are all drop-forged and heat treated.

The front axle is a single-piece I-beam drop forging, heat treated, with ball bearing in the hub. The rear axle is three-quarter floating and is contained in a pressed steel housing. The main driveshafts are alloy steel 1 1-16 inches in diameter. The differential is a two-pinion design carried on Hyatt rollers. The frame is a channel section of .25 carbon steel.

Cantilever Springs Used

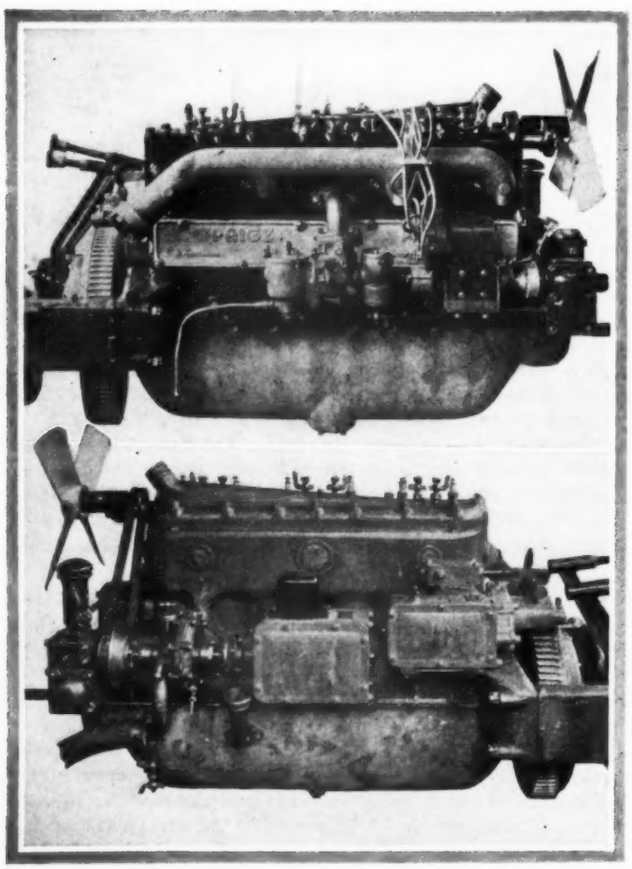
The springs are cantilevers, 30 inches long and 2 inches wide. They are of vanadium steel. The bodies are designed to have the maximum room. The streamline touring design seats five passengers. The distance from the heel board to the dash is 28 inches. The front seat inside the upholstery is 41 inches wide and 16 inches deep. The rear seat inside the upholstery is 47 inches wide and 18 inches deep. The front cushions are 7 inches in depth and the rear cushions 8 inches. The doors are 19 inches wide for the front and 21 inches for the rear. All doors have concealed hinges. The standard color is Richelieu blue with black running gear.

The equipment includes electric starting and lighting without side lamps, but with dimming bulbs in the headlights. Top, windshield, speedometer, extra rims, etc., are also included in the equipment.

Paige Has New Block Six at $1,395

Made in Both Touring and Roadster Form—Streamline Bodies and Crowned Fenders

Left—New Paige six-cylinder touring car which follows latest European body design. Right—Paige roadster. Both are mounted on the one chassis and sell for $1,395



Upper—Right side of motor showing piping and mounting of carbureter and magneto

Lower—Left side of motor showing water pump, oil gauge and starting and lighting units

THE Paige-Detroit Motor Car Co., Detroit, Mich., is bringing out a new six under the model number of 6-46. Mounted on a 124-inch wheelbase, either a touring car or roadster may be had at $1,395, with streamline body and full equipment.

The power plant used in connection with this new car is a Continental product having its six L-head 3 1-2 by 5 1-4-inch cylinders cast in a single block. The material used in the cylinders is reverberatory air-furnace iron. The cylinders and the upper half of the crankcase are cast together, a feature which is claimed to add both accessibility and strength. The cylinders are bored and ground to a finish fit. A three-speed gearbox is provided.

Detachable Heads

The waterjacket heads are cast separately and are fastened to the cylinders by twenty-two bolts. Water leakage is prevented at the point of connection by a copper asbestos gasket. When these heads are removed the interiors of the cylinders are accessible for inspecting the valves, pistons and cylinders. The oil pan is of stamped sheet steel and the false bottom containing the oil troughs is separate, being riveted to the pan.

Valves on the Right

The valves are all on the right side and are completely housed with aluminum plates giving an oiltight chamber in which the valve action operates. The valves are all driven from a single camshaft. The camshaft taking its drive from a cross shaft at the front of the motor. The latter shaft also serves for the magneto, generator, water pump and the fan pulley. A bronze spiral gear on the end of the crankshaft drives a cross shaft which in turn drives all the auxiliary parts to steel spiral gears which operate in oil. This form of drive is claimed to be as quiet as it is possible to secure and at the same time to be accurate in keeping the timing of the valves correct under all conditions. Because the parts having frictional contact run in oil, the wear is reduced to a minimum.

The electrical equipment is provided by Gray & Davis for lighting and starting and by Bosch for ignition. This is a two-unit installation, 1 unit, the Gray & Davis motor generator takes care of lighting and starting and the Bosch magneto takes care of ignition. The mounting of the starting motor and generator is such as to provide accessibility with an aim of maintaining freedom from dirt, grease and oil.

Two arms extending from the back of the motor form a housing to which is fastened the gearset housing providing a unit transmission. The clutch is in the flywheel and is a multiple disk with cork inserts. The continuous housing is oil-proof, allowing the clutch to operate continuously in a bath of lubricant. The drive is transmitted through a three-speed gearbox to a driveshaft having two universal joints. The rear axle is a three-quarter floating design with a housing of malleable iron. A .625-inch crossbar takes the strain of the road shocks from the axle housing.

Cantilever Spring Suspension

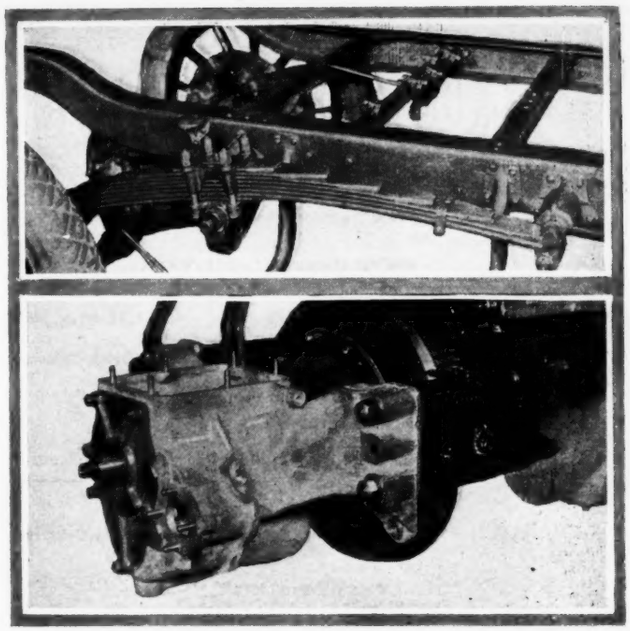
The brakeshafts are mounted on stiff brackets. There are two sets of brakes on the rear wheels. The drums are 14 inches in diameter and the face width is 2 inches. Cantilever spring suspension has been adopted. The length of the springs is 48 inches and the width 2.5 inches. The drive is taken through the cantilever springs and through the torque arm. The front axle is an I-beam section drop forging. Spring pads are forged integrally with the axle and have a curved shape so as to conform with the spring seat. The spring leaves are made of high carbon steel, heat-treated, for resiliency and strength. The spring eyes are provided with means of lubrication.

Easy Steering Control

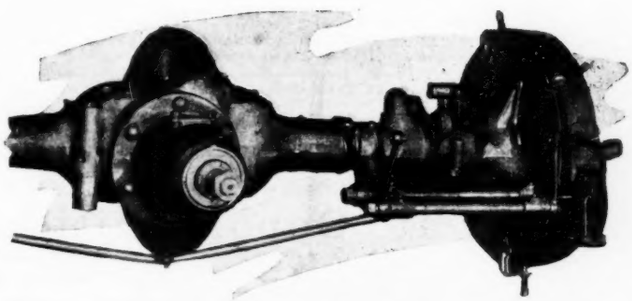
Irreversible steering is used. The trunnion arm is in a straight line so that the road shocks transmitted to the wheel do not give a turning moment on the steering wheel thus removing the strain from the driver's hands. This gear is a nut-and-sleeve type made by the Jacox company.

Streamline Body and Crowned Fenders

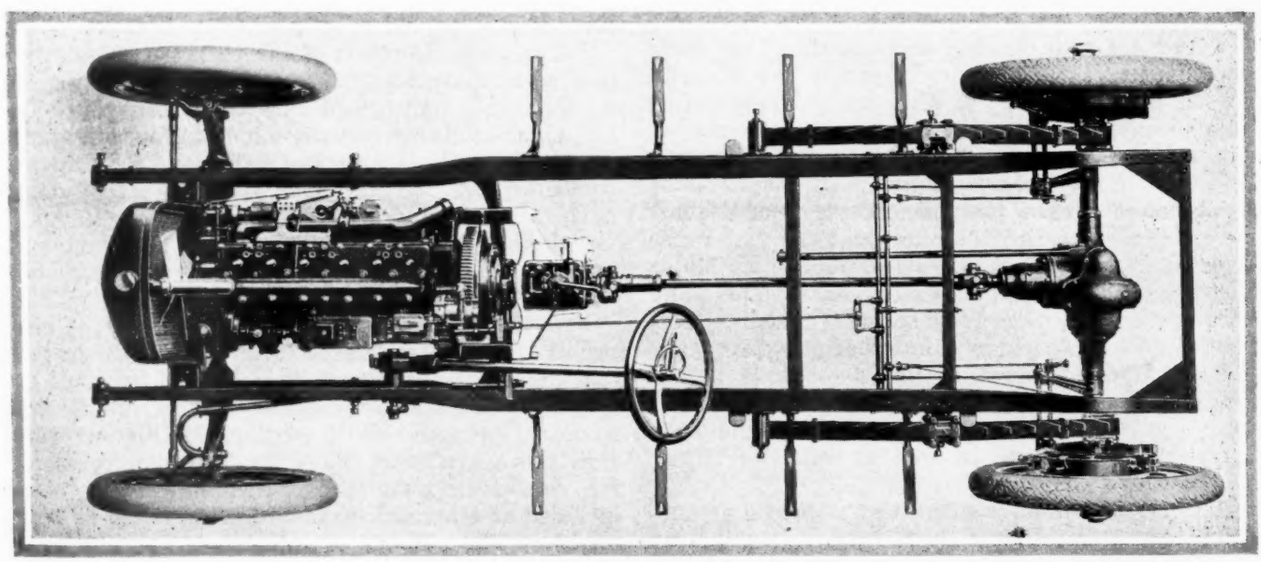
The body is a streamline design capable of carrying seven passengers. The doors are U-shaped with flush tops. The upholstery is of leather and the tonneau is supplied with a foot and robe rail. Two auxiliary disappearing seats fold against the back of the front seats. The fenders are of the latest design, being crowned. Running boards are steel stampings covered with linoleum. Equipment is complete.



Upper—Paige cantilever spring construction. The drive is taken through the springs but the torque reaction is taken care of by a torque arm. Lower—Gearset showing attachment to crankcase. Note teeth on flywheel for starting the motor by Gray & Davis system



Rear axle illustrating details of differential housing and brake members. A cover plate makes the differential easily accessible and the driving pinion may also be removed without much difficulty



Plan of Paige chassis showing block motor in unit with gearset, contilever rear springs and three-quarter floating axle. The frame is strongly braced

The Automobile

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Speedway Opportunities

WITH practically double the number of automobile speedways for next year, it is anticipated that the use of these special speed creations will be broadened and that something more than speed and endurance will result. Races have done much for the advancement of the motor science and are still playing their part. They have been pioneers in many lines of motor development.

But a greater variety of tests can be conducted on these speedways, tests which, while they cannot vie with the speed spectacle in public approval, nevertheless do much to solve many of the problems of the automobile. The fuel efficiency tests of the last few months have had their lessons; the endurance tests have brought out not a few factors in motor lubrication and cooling, as well as carburetion; and there yet remains room for a series of research tests that would be particularly illuminating. The question of wind-resistance at various speeds is not appreciated as it should be and some research tests along this line would be very valuable to manufacturers and interesting as well as valuable to car owners.

The question of lubricating the motor of a touring car when traveling with its load and equipment at maximum speeds is a problem yet far from being settled with all makers. True this condition is not frequently met with in regular use, but it is for the extreme cases that the factor of safety must be provided. Oil temperatures at different sustained speeds could be measured; tire temperatures and pressures might be noted; the question of wheel slip at different speeds is a vital factor in tire wear and could be looked into to advantage; in fact, there are several forms of research tests that could be carried out, tests equally essential to the maker, the dealer and the user.

Body Comforts

IT is rarely that any one season witnesses so many refinements in body construction and finish as are found in many of the 1915 cars. Frequently more than a dozen alterations of one nature or another exist, all carried out with the one thought of giving greater comfort to the passengers. That this is essential is well borne out by the comment of a pioneer automobilist, who has been driving cars since the days of the early steam types, to the effect that comfort in riding is today one of the major considerations in an automobile, if not the great one!

Comfort has been increased for next season by a general improvement in seat design, the cushions in many cars being properly tilted to meet the needs of the passenger, as well as the upholstery being heavier in most low and medium-priced machines.

The low body is always desirable, and many of the new models are well featured in this respect. The underslung spring has played its part in this movement, so has the dropped frame, and so has the dropped front axle.

Four-passenger bodies give evidence of being slightly more popular than the present year, this tendency being in line with European trends previous to the war. The four-passenger body gives a much better design, getting away from the width at the back seat and making it possible to have the maximum body width between the front and rear seats, if so desired. This design adds to the streamline effect.

Early announcements point to more colors than this year, there being many more color options in medium and high-priced cars than formerly. The staid black will not be so dominating, notwithstanding the natural tendency the war would have toward somber colors. While black is the great predominating tone and greens, blues and grays in many varieties have large followings, there are many concerns that are giving other semi-gaudy color combinations that should suit the most fastidious.

Production and manufacturing requirements have produced a few tendencies for next season. In general there are fewer body models with many of the lower-priced cars, the one-body policy taking hold in not a few cases. With medium and higher-priced cars there are often more models than formerly, the cabriolet, coupelet or other new ideas being included as standard types and often listed as stock models. The number of limousines has not materially increased, but coupés and sedans are more in evidence.

Washington Road Men Want H.P. Tax

225 Delegates at State Good Roads Assn. Meeting Adopt Resolutions for Increasing Highway Funds

SEATTLE, WASH., Nov. 26—Closing the most interesting, educational and successful session in the 15 years of its existence, the annual convention of the Washington State Good Roads Assn. adjourned at Spokane last week to meet in November, 1915, at Ellensburg, Wash. Two hundred and twenty-five delegates representing twenty-two counties and representatives from Oregon, Idaho and Montana, were in attendance at all four sessions held during the 2 days' convention.

Serious consideration was given the subject of road maintenance, and the convention adopted resolutions urging the Washington legislature which meets in January to increase the present maintenance fund of 5 per cent. The resolutions also declared in favor of completing the comprehensive construction program begun in 1913 before additional appropriations are made for extensions and laterals; that the present levy of a mill for state roads and a mill and a half for permanent highways, which annually produce approximately $3,500,000, be continued; that automobiles be taxed in proportion to their horsepower, the receipts therefrom to go into a maintenance fund and returned to the counties from which the money comes; that a new and more modern automobile code be adopted; that a compulsory road dragging law be enacted; that danger signs and signals on all roads be standardized; and the continued use of convicts on roads under the present honor system was favored.

Never before in the history of the Pacific Northwest was so much genuine interest displayed in a good roads convention. Speeches, papers and stereopticon illustrated lectures were given by men of national prominence. The office of Public Roads, United States Dept. of Agriculture, was represented by E. W. James, who delivered an address on highway maintenance, which subject was the keynote of the convention. Others who spoke were Governor Ernest Lister, of Washington; Lieut. Governor Louis H. Hart; former Governor M. E. Hay; Governor-elect Alexander, of Idaho; Samuel Hill, president of the American Roads Builders' Assn.; and H. S. Earle, of Detroit.

—

Lincoln Highway Is Now Complete

DETROIT, MICH., Nov. 28—Every mile of the 3,389-mile Lincoln Highway is now in condition. A demonstration such as was never before made in connection with any good roads movement was made yesterday by all the consuls of the Lincoln Highway Association. Along the entire route, from coast to coast, each consul or some one representing him, drove over that section or part of the route over which he has jurisdiction, for the purpose of demonstrating that the road is fit for travel. Thus about 200 Lincoln Highway workers took part in the run, which was started as near as possible everywhere about 6 a. m. and completed as near as possible by 6 p. m., to make it a 12-hour run.

The runs ranged as to distance from 8 and 10 miles to over 300 miles, although this was quite exceptional. In addition to inspecting their territory the consuls and observers will later make detailed reports as to what is still to be done in their respective section. The principal object of the demonstration has however been to show that it does not require any longer that a tourist take side roads or other roads than the official Lincoln Highway route.

—

Wants Better Roads in Mt. Rainier Park

WASHINGTON, D. C., Nov. 30—Motor cars and motorcycles contribute so large a share of the revenues of the Mount Rainier national park in the state of Washington that Ethan Allen, superintendent of the park, in a report made today to the Secretary of the Interior, predicts that as soon as the roads are improved so that these vehicles can move with safety over all of them the revenues will be sufficient to meet the expenses of an economical administration of the park affairs.

Desirous of getting this revenue just as quickly as possible, Superintendent Allen recommends expenditure of funds for road improving, and suggests that an "engineer corps" be attached to the park service to prepare improvement and maintenance details.

The report shows that during the year ended September 30, 1914, 1,594 permits were issued to owners of private motor cars to use the roads of the park for travel. These permits are good for repeated entrances until December 31 of the year of issue. For each of these permits a fee of $5 was exacted, making the revenue collections from this source $7,970, while public motor cars paid $650. "It is confidently predicted," says Superintendent Allen, "that park revenues will be sufficient to meet the expenses of an economical administration of park affairs as soon as the present road is permanently improved and safety and comfort assured to motor car users."

—

59,507 Fords Sold in 3 Months

DETROIT, MICH., Nov. 30—During the first 3 months of the buyers' profit-sharing plan of the Ford Motor Co., which started August 1, 1914, a total of 59,507 Ford cars were sold, or an average of 19,835 cars per month.

The buyers' profit-sharing plant calling for a return or refund of $40 or $60, according to the car bought, provided that between August 1, 1914, and August 1, 1915, a total of 300,000 cars are sold and delivered, the 59,507 cars sold to October 31 represent a refund of at least $2,380,280 on the basis of a rebate of only $40 per car. By taking the average of $50 as the return to each buyer, the amount to be returned by the Ford company would be $2,975,350 for the first 3 months' business on the new plan. If the 300,000 cars are sold and delivered then the return to buyers will amount to between $12,000,000 and $15,000,000.

—

Argo Production 750 Per Month by March

JACKSON, MICH., Dec. 1—W. R. De Voe, of the Argo Motor Co., states that the first run of the company of 200 cars is in full swing and will be completed about the time material for the second lot, 500, reaches it around December 5. These are to be followed by 500 cars in January, and it is anticipated a production of 750 per month will be reached by March 1.

—

Canada's Imports 1,406 Cars Under 1913

OTTAWA, CAN., Nov. 30—Canada's imports of automobiles even in war times continue to increase. During September, the second month of the war, Canada imported from the United States 260 automobiles, as compared with 253 in September, 1913. Total imports for the 9 months of 1914, however, show a contraction of 1,406, this year's imports being 3,854, against 5,260 in 1913.

—

Canada Forbids Rubber and Graphite Exports

OTTAWA, ONT., Nov. 30—An order-in-council has been passed forbidding export from Canada to any country other than part of the British Empire of rubber and graphite. This action has been taken to prevent supplies of the commodities reaching Germany. Canada imports $4,000,000 worth of crude rubber each year and exports about $500,000. About $120,000 worth of graphite is exported, principally to the United States, and the production in Canada amounts to about $100,000 worth per year. It is produced at Buckingham, Que.; Calabogie and Port Emsley, Ont.

—

DETROIT, MICH., Nov. 30—Walter B. Brady, for the past 6 years special representative with the Studebaker sales department, has resigned to join the Maxwell forces in the same capacity beginning December 1. Mr. Brady was the oldest of the present Studebaker organization in point of years of service. He will travel the entire United States in the Maxwell interests.

Saxon Leases Abbott Factory

Adds 120,000 Square Feet—To Increase Production of Fours and New Six-Cylinder Car

DETROIT, MIICH., Nov. 30—The Saxon Motor Co. has taken a 5-year lease of the plant of the Abbott Motor Co., and will occupy the premises January 1, 1915. This will give the Saxon company a total floorspace of 180,000 square feet, of which 60,000 are in the present plant of the Saxon company on Bellevue avenue.

For some time the manufacturers of the Saxon cars, whose business has increased very rapidly, have contemplated either locating in another city offering suitable inducements for a new plant, or building a new plant in Detroit. When it became known that the Abbott company contemplated locating in another plant negotiations were started with that company. Recently the Abbott plant at Beaufait avenue and Waterloo street was purchased by Wallace Bros., from the purchasers of the Abbott assets, but this deal also involved the transfer of subdivision real estate valued at $40,000 and the final transaction was only concluded last week.

It is rumored that the Saxon company will some time next year have a new modern plant erected on Bellevue avenue. At the present time this cannot be undertaken without interfering greatly with the general workings of the company.

The Saxon Motor Co. was organized the latter part of 1913 and has a capital stock of $350,000. The leasing of the Abbott plant involves, all told, about $140,000.

The Saxon company will for the time being continue to occupy its present plant at Bellevue avenue, but as soon as it will be possible the whole works will be located in the Abbott plant, which will be altered or such changes effected to suit the Saxon requirements.

Automobile Securities Quotations

NEW YORK CITY, Dec. 1—Automobile stocks in general experienced a slight increase in the trading on the curb and in private deals this week and tire securities made an even better showing. The following bid and asked quotations are those which a prominent brokerage house finds to obtain in private sales and are to be taken only as a guide until the re-opening of the Stock Exchange.

	1913		1914	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	200	225	...	...
Ajex-Grieb Rubber Co., pfd	97	102	...	...
Aluminum Castings, pfd	93	101	...	...
J. I. Case preferred	...	...	...	...
Chalmers Motor Company, com	...	95	...	97
Chalmers Motor Company, pfd	...	96	...	...
Electric Storage Battery Co	...	...	...	...
Firestone Tire & Rubber Co., com	...	250	335	340
Firestone Tire & Rubber Co., pfd	102	104	109	112
Garford Company, preferred	80	90	...	...
General Motors Company, com	36	37	68	72
General Motors Company, pfd	73	74½	85	88
B. F. Goodrich Company, com	16	16½	23½	25½
B. F. Goodrich Company, pfd	77	78	...	...
Goodyear Tire & Rubber Co., com	200	210	180	184
Goodyear Tire & Rubber Co., pfd	93	95	99	99¾
Gray & Davis, Inc., preferred	95	100	...	...
International Motor Co., com	...	5	...	...
International Motor Co., pfd	...	15	...	...
Kelly-Springfield Tire Co., com	50	60	60	63
Kelly-Springfield Tire Co., 1st pfd	90	101	75	80
Kelly-Springfield Tire Co., 2nd pfd	...	...	90	95
Lozier Motor Company, com	...	16	...	...
Lozier Motor Company, pfd	...	90	...	...
Maxwell Motor Company, com	2	2½	13	17
Maxwell Motor Company, 1st pfd	18½	19½	44	47
Maxwell Motor Company, 2nd pfd	5½	6	17	19
Miller Rubber Company	120	130	133	138
New Departure Mfg. Co., com	145	160	...	...
New Departure Mfg. Co., pfd	100	102	...	...
Packard Motor Car Company, com	...	...	...	100
Packard Motor Car Company, pfd	91	94	89	...
Peerless Motor Car Company, com	15	25	...	...
Peerless Motor Car Company, pfd	75	85	...	...
Pope Manufacturing Co., com	...	3	...	...
Pope Manufacturing Co., pfd	10	15	...	...
Portage Rubber Co., com	...	35	...	...
Portage Rubber Co., pfd	...	90	...	...
Reo Motor Truck Company	...	7⅛	10½	11
Reo Motor Car Company	..	15½	21½	22½
Splitdorf Electric Co., pfd	...	...	...	...
Stewart-Warner Speedometer Corporation, com.	50	55	46	48
Stewart-Warner Speedometer Corporation, pfd.	96	97	96	99
Studebaker Corporation, com	15	16	...	...
Studebaker Corporation, pfd	66	69	...	...
Swinehart Tire & Rubber Company	78	80	82	85
Texas Company	...	...	...	...
U. S. Rubber Co., com	52½	54½	...	...
U. S. Rubber Co., pfd	98½	99	...	...
Vacuum Oil Company	191	193	202	...
White Company, preferred	104	110	...	...
Willys-Overland Co., com	60	63	70½	75
Willys-Overland Co., pfd	82	88	87	90

The par value of these stocks is $10.00, all others $100.00.

Buick Ships 125 Cars a Day

FLINT, MICH., Nov. 28—Although the working force of the Buick Motor Co., was reduced somewhat November 1, an average of 125 cars were made and shipped daily this month, with several higher marks of 150 to 175 and with a low mark of eighty. This was due to the shortage on freight cars as whenever a sufficient number of railroad cars were available they were generally all filled.

Up to the middle of this month the company was fully 10,000 cars ahead in production and sales over the number at that time of the year in 1913. The following figures show the actual number of the year's new models made during July, August, September and October, 1913 and 1914, and represent at the same time the number of cars delivered.

1913		1914
12	July	1,849
859	August	4,671
2,116	September	5,630
3,450	October	5,219
6,437		17,369

Thus in those 4 months of 1914 the company made 10,932 more cars than during the corresponding period in 1913.

Rubber Imports 5,476,049 Lbs. in 3 Weeks

NEW YORK CITY, Nov. 30—The imports of Para rubber at this port from October 29 to November 19 amounted to 5,476,049 pounds. The largest shipment was on October 29, when 1,379,626 pounds were brought in on the steamer Denis from Para and Manaos. The November 19 shipment amounted to 539,147 pounds by the steamer Sao Paulo from Para. The receipts of rubber from Para during the month of November amounted to 1,200 tons, with 400 tons more now afloat for December arrival. The receipts of plantation rubber amounted to 2,583 tons. It is estimated that there is now afloat from Ceylon to London about 700 tons of plantation, in three boats, namely, the St. Egbert, City Delhi and Kabinga, but under the present embargo, of course, none of this will reach the New York market. Advices from Germany are to the effect that all the crude rubber in that country is now being used for tires and other military equipment.

U. S. Rubber Export Co., Ltd., Incorporated

NEW YORK CITY, Nov. 30—The United States Rubber Export Co., Ltd., which has been incorporated under the laws of Delaware with an authorized capital of $100,000, will be a subsidiary of the United States Rubber Co. to handle the export business of the parent company and of its various subsidiary manufacturing companies.

The incorporators are: J. D. Carberry, assistant secretary of the United States Rubber Co.; Samuel Norris, secretary of that company, and F. V. Glynn, who is attached to the secretary's office. Next week the organization of the company will be completed by the election of directors and officers.

Lower Prices on Federal Casings

NEW YORK CITY, Nov. 30—The Federal Rubber Mfg. Co., Milwaukee, Wis., has announced a reduction in prices on its rugged tread casings. The new prices, effective December 1, 1914, are as follows:

SIZE	FORMER PRICE	PRESENT PRICE
30 x 3	$18.20	$13.80
30 x 3½	24.30	18.50
31 x 4	31.55	25.70
33 x 4	33.70	27.55
34 x 4	34.80	28.50
36 x 4½	45.65	40.95
36 x 5	55.60	47.65

Finds Western Conditions Greatly Improved

CLEVELAND, O., Nov. 25—C. A. Emise, sales manager of the Chandler Motor Car Co., has returned from a trip through the South and Pacific coast, during which he visited sixteen states. Everywhere conditions were found greatly improved, in fact they are quite normal, according to Mr. Emise. In the territory west of the Mississippi river the

dealers declared themselves very optimistic over the business outlook for 1915. "The great irrigation projects in Arizona, New Mexico and Western Texas are inaugurating a wonderful era in agricultural prosperity, which is bound to have its effects on the sale of automobiles," said Mr. Emise. "In Texas and the other southwestern states the recent improvement in the cotton situation has started a renewal of business activities all along the line. Cotton planters and brokers are confident that within a very short time the South will forget the temporary embarrassment which followed the fall in the cotton market."

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DETROIT, MICH., Nov. 30—The regular quarterly dividend of 1 3-4 per cent. upon preferred stock of the Packard Motor Car Co. will be paid December 15 to stockholders of record at the close of business on November 30.

—

N. A. C. C. Co-operates with Congress

NEW YORK CITY, Dec. 2—At a meeting of the directors of the National Automobile Assn. of Commerce, Inc., held today all members were present excepting L. H. Kittredge, of the Peerless company. The question of what action the chamber shall take in fighting the present Kardo patent litigation was gone over thoroughly and definite action will be taken at the meeting of members tomorrow.

Today a trade committee was appointed, whose duties will be to co-operate with the federal authorities at Washington by furnishing them with any and all information they may be in need of with regard to the automobile industry. The feeling among the automobile makers is that there is no disposition on the part of Congress to inflict any hardships on the industry and the industry in turn is making every advancement to co-operate for the general benefit of trade.

—

PIERRE, S. D., Nov. 28—As reflecting the conditions of prosperity in South Dakota the record of ownership of automobiles is significant. From Pierre comes the word that the total number of licenses taken out this year is 20,600 and that before the year is gone the number will undoubtedly pass 21,000.

—

Gilbert Answers Allen in Patent Suit

NEW YORK CITY, Nov. 30—E. G. Baker, New York representative of the Gilbert Mfg. Co., New Haven, Conn., has filed an answer in the suit brought by the Allen Auto Specialty Co. in the United States District Court in New York. He denies that the Gilbert tire cover infringes the Nathan tire cover patent No. 799,662, and declares the patent invalid. Aside from the usual denials in infringement actions Baker alleges that the claims of the Nathan patent, if properly restricted, do not cover the Gilbert device.

—

Lozier Hearing Postponed Until Dec. 8

DETROIT, MICH., Nov. 27—Judge Tuttle, of the United States District Court, has postponed the hearing of the Lozier Motor Co. until December 8, or the day after the meeting of the stockholders of the company, who are to decide upon the reorganization plans at a meeting specially called for that purpose for December 7.

—

Scarborough Co. Files Bankruptcy Petition

INDIANAPOLIS, IND., Nov. 18—The Scarborough Co., of this city, engaged in the business of manufacturing guide maps for use by automobile tourists, has filed an involuntary petition in bankruptcy and James W. Taylor has been appointed receiver for the concern.

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To Sell Benham Plant Dec. 8

DETROIT, MICH., Nov. 28—The plant of the bankrupt Benham Mfg. Co., at 1882 Mt. Elliott avenue, will be sold at public auction December 8 by the Union Trust Co., trustee. The sale will be subject to confirmation by the district court. The plant consists of a two-story brick and reinforced concrete building 90 by 170, a two-story frame building 53 by 116, another frame building 40 by 93 and a heating plant. The main building is equipped with machinery and other equipment for automobile manufacturing, while the smaller of the two frame buildings contains machinery and equipment for a wood working plant. The total value of the plant is estimated to be $50,000.

Makers of New Fuel Incorporate

Zoline Co., a $100,000 Corporation, to Proceed with Manufacture—Car Builders Interested

INDIANAPOLIS, IND., Nov. 30—The Zoline Co. has been incorporated with an authorized capitalization of one hundred thousand dollars. The company is to manufacture Zoline, a substitute fuel for gasoline, invented by John Andrus of McKeesport, Pa., which has been tested at the Indianapolis speedway as reported in THE AUTOMOBILE for November 26. The fuel was tried out in a 1,000-mile run by a Marmon six. The car made 7.42 miles per gallon.

All of the capital stock, except ten shares, will be issued to Mr. Andrus, Carl G. Fisher and Dr. W. H. Chambers of McKeesport, Pa., in consideration of an assignment by them to the corporation of all respective rights under a contract entered into by and between Mr. Andrus and Mr. Fisher on October 10, 1914.

Others interested in the company are James A. Allison, Ernest W. Bradford and Howard C. Marmon, Indianapolis, and Henry B. Joy, Detroit, Mich.

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Willems Is Dodge Foreign Representative

DETROIT, MICH., Dec. 2—*Special Telegram*—G. E. Willems has been appointed as foreign district representative for Dodge Bros., assigned to territory in the Far East. Mr. Willems' appointment is understood to be the first of similar steps to be taken by this company in the near future, looking toward the building up of a stable foreign export business. For several years he represented a large French company in Egypt. Later he left for India where he took up the importation and sale of motor cars.

Market Reports for the Week

Most of the changes in the market reports this week were of the usual order. A number, however, which have been quite steady of late, made changes. These were lead, cyanide potash and rubber. Lead went down $0.10 per 100 pounds, closing at $3.80; cyanide potash dropped from $0.25 to $0.23 and rubber closed at $0.71 a gain of $0.04. Both coppers went up $0.00 1-4 per pound. There was some buying for export to France and more sales to domestic consumers for December, January and February delivery. Tin dropped $0.85 per 100 pounds, closing at $33.15. The local market was quiet. The London market was, however, strong and higher. Since the first of January the imports of tin at New York City and outports have been 39,627 tons. The oils and lubricants markets remained unchanged. The petroleum markets continue steady. Cottonseed oil rose $0.21 a barrel, closing at $5.75.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.13½	.13½	.13½	.13½	.13½	.13½	.....
Beams & Channels, 100 lbs.	1.21	1.21	1.21	1.21	1.21	1.21	.....
Bessemer Steel, ton	18.00	18.00	18.00	18.00	18.00	18.00	.....
Copper, Elec., lb.	.12⅜	.12⅜	.12⅜	.12⅜	.12⅜	.12⅝	+.00¼
Copper, Lake, lb.	.12½	.12½	.12½	.12½	.12½	.12¾	+.00¼
Cottonseed Oil, bbl.	5.54	5.60	5.60	5.91	5.86	5.75	+.21
Cyanide Potash, lb.	.25	.25	.25	.25	.23	.23	—.02
Fish Oil, Menhaden, Brown	.38	.38	.38	.38	.38	.38	.....
Gasoline, Auto, bbl.	.13	.13	.13	.13	.13	.13	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	3.90	3.90	3.90	3.90	3.80	3.80	—.10
Linseed Oil	.47	.47	.47	.47	.47	.47	.....
Open-Hearth Steel, ton	18.00	18.00	18.00	18.00	18.00	18.00	.....
Petroleum, bbl., Kans., crude	.55	.55	.55	.55	.55	.55	.....
Petroleum, bbl., Pa., crude	1.45	1.45	1.45	1.45	1.45	1.45	.....
Rapeseed Oil, refined	.71	.71	.71	.71	.71	.71	.....
Rubber, Fine Up-River, Para	.67	.68	.71	.70	.71	.71	+.04
Silk raw, Ital.	..	..	..	..	3.90	3.90	.....
Silk, raw, Japan	..	..	..	..	3.13	3.15	+.02
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	34.00	33.75	33.50	33.38	33.00	33.15	—.85
Tire Scrap	.05	.05	.05	.05	.05	.05	.....

Peerless Gets Big Truck Order Abroad

London Firm Orders 250 and 50 Per Week Thereafter— Standard Also Reports Sales

NEW YORK CITY, Dec. 2—It was learned on good authority today that the Peerless Motor Car Co., Cleveland, O., has recently made a sale of 250 trucks in London through Gaston, Williams & Wigmore. The trucks are mostly 4-ton types to be fitted with conventional army body. Besides this initial order of 250 there is an order for fifty a week after this number has been fulfilled for a period until notification terminating such has been given.

It is also understood that the Standard Motor Truck Co., Detroit, has made a large sale of trucks in London and that shipments of these have been in progress for some time.

Four-Cylinder Pratt $1,950

ELKHARDT, IND., Nov. 30—Two new Pratt models will be marketed for 1915 by the Elkhart Carriage Mfg. Co., Elkhart, Ind. One is a four-cylinder Forty selling for $1,950 with five-passenger body and the other is a six-cylinder Fifty priced at $2,150 when equipped with five-passenger body. Four body styles will be offered with each chassis; two, four, five and seven-passenger types.

These cars are made from standard parts throughout. Continental motors with multiple-disk clutch and Brown-Lipe four-speed gearset with direct on third are used. The four-cylinder motor is an L-head design with cylinders 4.125 by 5.25 inches cast in a block. The six has a bore and stroke of 3.75 by 5.25 inches. The cylinders are cast in threes. The electrical system includes a Gray & Davis starting and lighting system and an Atwater Kent ignition outfit. Timken axles are used on all cars.

The equipment includes a one-man top, Collins curtains, Kellogg power tire pump, Troy clear-vision windshield, Jones speedometer, eight-day rim-wind clock, electric horn, nickel-plated bumper of channel steel, etc.

NEW YORK CITY, Dec. 2—Russell T. Kingsford, chief engineer of the Rushmore Dynamo Works of the Bosch Magneto Co., has tendered his resignation to accept a similar position in charge of the private laboratory now being fitted out by S. W. Rushmore, who recently sold the Plainfield works to the Bosch company.

NEW YORK CITY, Dec. 2—The Donnelly Motor Equipment Co., a local corporation dealing in automobile accessories, has made an assignment to Edward J. Walters. It was incorporated in June, 1913, with a capital stock of $5,000, and Richard F. Ely is president.

Engineer Petard Wounded at Meuse

RACINE, WIS., Nov. 28—Capt. Wm. Mitchell Lewis, president of the L. P. C. Motor Co., Racine, Wis., has received a cablegram from Paris that Capt. René Petard, chief engineer and vice-president of the Racine concern, has been seriously wounded in the fighting at Meuse. M. Petard is a captain of engineers in the French army and has taken part in practically all of the heavy fighting since the outbreak of the war. He was with the range-finding corps in the trenches, but is now in the hospital at Cote d'Or, southeast of Paris. Capt. Petard went to Europe last June to test out the Lewis six, but was pressed into service at once and the car commandered for use by staff officials.

S. A. E. Winter Session January 5-7

NEW YORK CITY, Dec. 2—A tentative program for the winter session of the Society of Automobile Engineers has been announced. The meeting will be held in this city Tuesday, Wednesday and Thursday, January 5, 6 and 7. The meeting on Tuesday will be for the standards committee in the morning, governing committees of sections in the afternoon and council in the evening. All members are invited to attend the session of the standards committee. These meetings will be held in the rooms of the society at 1790 Broadway. Thirteen papers and fourteen standards committee division reports will be submitted for discussion.

The remainder of the schedule will be held at the Engineering Societies Building. It is the regular professional session and is made up as follows:

WEDNESDAY, JANUARY 6, 10 A. M.

President's Address.
Treasurer's Report.
Report of Tellers of Election of Officers.
Report of Membership Committee.
New Business.
Report Ball and Roller Bearings Division.
Report Carbureter Fittings Division.

WEDNESDAY, JANUARY 6, 1 P. M.

In the Auditorium, Engineering Societies Building, (29 West Thirty-ninth Street.)

PROFESSIONAL SESSION

Recording Devices for Commercial Power Wagons.—Bruce Ford.
Report of Truck Standards Division—Wm. P. Kennedy, Chairman.
Report of Commercial Car Wheels Division.—Wm. P. Kennedy, Chairman.
Report of Electric Vehicle Division.—A. J. Slade, Chairman.

INFORMAL DINNER, AT 6.30 P.M.

At the Engineers Club (32 West Fortieth Street.)

WEDNESDAY, JANUARY 6, 8 P. M.

In the Auditorium, Engineering Societies Building, (29 West Thirty-ninth Street.)

Pros and Cons of Correct Tire Inflation.—C. B. Whittelsey.
Report of Pleasure Car Wheels Division.—Henry Souther, Chairman.
Wire Wheels versus Wood Wheels.—R. B. Mudge.
Wire Wheels versus Wood Wheels.—Geo. W. Houk.
Report of Lock Washer Division.—J. E. Wilson, Chairman.
Report of Miscellaneous Division.—J. G. Utz, Chairman.

THURSDAY, JANUARY 7, 10 A. M. SHARP

In the Auditorium, Engineering Societies Building, (29 West Thirty-ninth Street.)

PROFESSIONAL SESSION

Report of Electrical Equipment Division.—A. L. Riker, Chairman.
Railway Gasoline Locomotives.—A. H. Ehle.
Railway Motor Cars.—H. G. Chatain.
Warning Signals.—Alden L. McMurtry.
Report of Research Division.—David L. Gallup, Chairman.

THURSDAY, JANUARY 7, 1 P. M.

In the Auditorium, Engineering Societies Building. (29 West Thirty-ninth Street.)

PROFESSIONAL SESSION

Malleable Iron Castings.—Dr. Richard Moldenke.
Report of Frame Sections Division.—J. G. Perrin, Chairman.
Report of Iron and Steel Division.—Henry Souther, Chairman.
Nomenclature of Car Parts.
Allowances for Piston Fits.—E. W. Weaver.
Worm Gears.—C. T. Myers.

INFORMAL DINNER, AT 6.30 P.M.

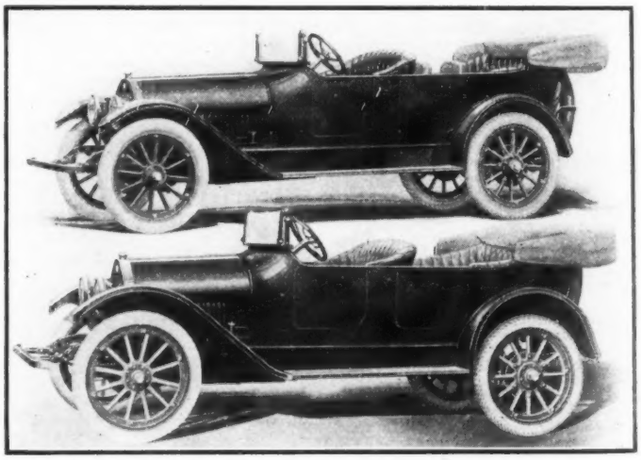
At the Engineers Club (32 West Fortieth Street.)

THURSDAY, JANUARY 7, 8 P. M.

In the Auditorium, Engineering Societies Building, (29 West Thirty-ninth Street.)

PROFESSIONAL SESSION

Automobile Engineering Curricula.—Prof. W. T. Fishleigh.
Motor Car Testing.—A. B. Browne.
Report of Springs Division.—C. W. McKinley, Chairman.
Report of Standards Exchange Division.—K. W. Zimmerschied, Chairman.
The European Situation as Affecting America.—A. Ludlow Clayden.



Upper—Pratt six-cylinder Fifty selling at $2,150 when equipped with five-passenger body. Four styles are furnished, two, four, five and seven-passenger for both this model and the four-cylinder chassis. Lower—Pratt four-cylinder Forty selling at $1,950 with five-passenger body

To Make Low-Priced Electrics and Trucks

Storms Company Organized to Build Passenger and Delivery Cars Selling at $650 to $950

DETROIT, MICH., Nov. 28—The Storms electric passenger and commercial cars which are to be placed upon the market in January will be made by the Storms Electric Car Co., a new concern, which has just been organized. William E. Storms, formerly with the Anderson Electric Car Co., is the designer and president of the company, Ferdinand H. Zilisch, a business man of Milwaukee, Wis., is vice-president and F. T. King, Detroit, is secretary and treasurer.

One standard chassis will be made by the new company, to take three different bodies, a coupé, a roadster and a delivery body. Wheelbase will be 90 inches and tread 44 inches. Completely equipped with electric lights inside and outside, electric horn and other stock equipment, the coupé is to sell at $950, the roadster at $750 and the delivery car at $650. The coupé will be made to seat three persons and the roadster two. The vehicles will be fitted with a specially designed battery which will travel 40 to 50 miles on a single charge. The commercial car will have a body to carry a load of 500 pounds.

Temporarily the headquarters are with F. T. King, 340 Gratiot avenue. Negotiations are now pending concerning a plant.

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PLAINFIELD, N. J., Nov. 28—The Spicer Mfg. Co., maker of universal joints in this city, has issued a series of five data sheets for the handbook of the Society of Automobile Engineers. These data sheets give complete illustrations and measurements of the different universal joints manufactured by this company. The illustrations show that only minor details have been made in these joints for 1915, but that radical changes are being made in propeller shafts in motor cars and trucks. The tubular construction has taken hold very strongly as it is lighter and stiffer than the solid shaft, thereby being less susceptible to whipping. With longer propeller shafts due to increased wheelbases in both passenger cars and trucks the time is opportune for greater development in the tubular propeller shaft.

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BOSTON, MASS., Nov. 28—Massachusetts motor organizations are now planning a campaign to have the law regarding blowing horns changed so that there will not be such a constant din in the city streets day and night. Under the law the drivers must blow the horn at every cross street where the view is obscured, also to warn pedestrians of danger. Another section states that it must not be sounded so as to make a harsh, and unreasonble noise. But when a driver is in the thickly settled part of the cities he must blow the horn every few feet because of the cross streets.

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Goodyear Safety Work Brings Good Results

AKRON, O., Nov. 28—A comprehensive report is being prepared by the Goodyear Tire & Rubber Co., showing the result, at the close of the fiscal year, of the Safety First movement in the factory.

For several years the company has had a safety engineer, whose business it is to install safeguards for machines and make safe places found dangerous. It is interesting to note that when the safety movement was first begun Goodyear factory employes were skeptical and some of them regarded the whole proposition as a joke. But, so greatly have factory accidents been cut down in number that the skepticism is all gone and nearly all of the 7,500 workmen are aiding the movement heartily. They are helped in this by a series of suggestion boxes, in which employes are requested to drop written recommendations, etc., the valuable ideas being rewarded accordingly.

The organization operates as follows: First there is a Central Committee, with the assistant to factory manager as chairman, and a membership of nine men from various parts of the plant who have opportunities for getting about. They report regularly on dangerous conditions found, and each Central Committeeman is chairman of a division inspection committee, so the work is very thorough. One result is that only four out of the 307 men on the committees have been victims, of injury, serious or otherwise.

A new development of the welfare work is a school for foremen,—two lessons a week for 6 months on Organization and Management. Other movements firmly established are lunch room, factory newspaper, library, labor department, hospital and police department, and fine results from all these movements for improving working conditions are reported.

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Oldsmobile Co. Advances Pioneer Employees

LANSING, MICH., Nov. 28—Statistics prepared under the direction of D. F. Edwards, comptroller of the Olds Motor Works, reveal that the automobile business holds out assurance of just reward for employees who apply themselves diligently and display intelligence in their work.

It was shown by Mr. Edwards in the course of his investigation that approximately 30 per cent. of the money paid in salaries and wages by the company since August 1 was paid to employees who had been identified with the company for a period of 3 years or longer.

It was also pointed out that 37 per cent. of the people on its payroll for the period ending October 31 had been in the employ of the company for 3 or more years, and that 30.9 per cent. of its employees had been on the payroll for 5 years or more.

What was even more noteworthy was the fact that 7 per cent. of the employees had been constantly connected for 10 years or longer with this company.

Reasonable remuneration of employees was a point touched upon by Mr. Edwards. To pay in proportion to the worth of an employee and to promote men long identified with the organization in preference to men secured from outside sources is a policy which, Edwards states, has resulted in keeping employees satisfied and living up to their best possibilities.

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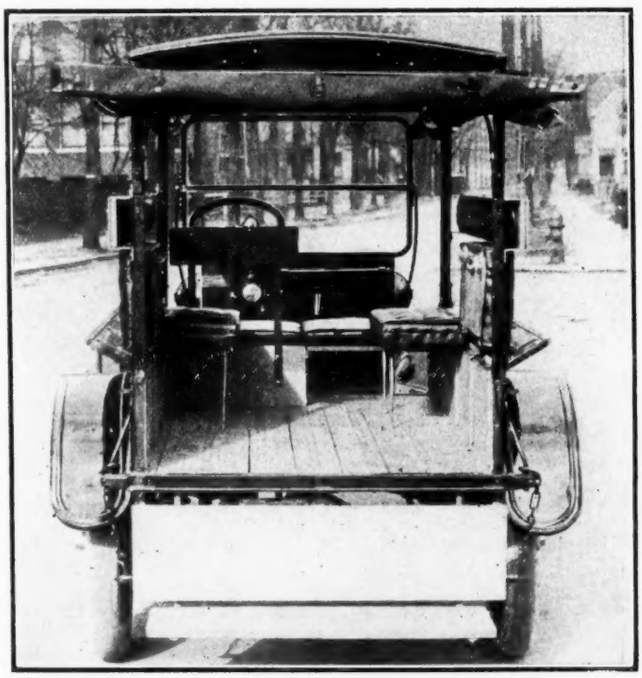
SPRINGFIELD, ILL., Nov. 28—The officers of the Wilson Tire and Rubber Co. announce that the stock in that concern, which has been selling at a par value of $10 per share, was advanced 25 per cent. on November 24. They state that the factory building in Harvard Park is practically completed, that some of the machinery has already arrived and that much equipment is on the way.



The Studebaker Corp., Detroit, Mich., is now furnishing its dealers with the ten-passenger car of convertible type illustrated above. This vehicle is identical in general construction as far as the chassis is concerned with the four-cylinder delivery car, the only difference being the body. The latter has collapsible seats running lengthwise, and if there are no passengers these seats may be pulled up and the entire body used as a baggage car. Even with all the seats occupied there is still enough room to carry extra luggage

306-Mile Open Race for Oklahoma City

Road Contest for $5,000 Purse Planned for May 1 as Annual Event

OKLAHOMA CITY, OKLA., Nov. 30—A 306-mile road race for a $5,000 purse, to be known as the Southwest Sweepstakes, open to automobiles of every make and horsepower to be held in Oklahoma City May 1 of next year, and annually thereafter is the plan now under way to completion by the Automobile Dealers' Assn., Oklahoma City.

Other purses and other races are being planned by the members of the association to arouse interest in automobile affairs in the southwest. George W. Woods, a publicity agent, conferred with a number of local automobile dealers and the plans for the races are now in progress. Dick Carhart, Overland agent and vice-president of the association, proposes that the event shall be made an annual affair. It is his proposal that the Oklahoma City 26-mile boulevard be linked with a portion of the Gulf-to-Winnipeg road, making a 9.9 mile course for the races.

Surveyors have been employed and are making blueprints of the proposed course which will be submitted to the A. A. A. for approval. It is the plan of those boosting the races that many of the dealers and manufacturers shall be interested in the Oklahoma City race as an opportunity to tune up their cars for the 500-mile Indianapolis race on Decoration Day.

Definite plans have been arranged already, however, for a 99-mile, free-for-all road race for stock cars, to be held here Thursday, April 29, or two days before the proposed Southwest Sweepstakes. To make the races a success an association to be known as the Southwest Racing Assn. is being organized.

To put the course in shape for fast time, the association plans to resurface many of the soft spots at a cost of several thousand dollars, eliminating a few bad turns and banking others, as well as dragging and rolling the entire course. In addition the entire course will be oiled. The automobile clubs of several of the Southwestern states have already written that they would assist.

Race Planned for San Diego, Jan. 9

LOS ANGELES, CAL., Nov. 27—A road race has been projected for San Diego which may take on the color of one of the big speed events of the 1915 season. The date as named by the boosters for the event is January 9, and it is believed that the racers entered at Corona will remain in Southern California for the San Diego event and then go north for the Vanderbilt and Grank Prix races, which are to be held on the exposition course February 22 and 27. The San Diego purse is to come from private individuals. The plan as outlined is for 100 sportsmen to give $100 each, making one of the largest purses ever offered for a motor racing event in the Pacific coast.

Maxwell First Entrant for Indianapolis Race

INDIANAPOLIS, IND., Nov. 28—First entry for the next Indianapolis 500-mile race has already been made, three Maxwells being sent to the post 6 months ahead of the contest. Billy Carlson, the Los Angeles veteran, is the only driver to be named thus far, however, the rest being reserved for choice later on, with Tetzlaff and Oldfield as favorites.

The design of the Maxwells, as last year, is attributable to Ray Harroun, winner of the 1911 500-mile contest.

The piston displacement of the cars falls barely under 300 cubic inches, the limit prescribed by the speedway management. Their bore and stroke is 3 3-4 by 6 3-4, classifying them as of the so-called long-stroke type.

One of the machines will be finished shortly and taken to the speedway for a thorough tryout, lasting a week or 10 days. Harroun himself will conduct these tests.

Originally Harroun planned to produce a double set of cars, reserving one for entry in the French Grand Prix. The European war, however, called a halt to that program.

Hudson 6-54 Wins Harrisburg Economy Run

HARRISBURG, PA., Nov. 26—Eighteen cars were entered in the annual Economy Contest of the Motor Club of Harrisburg held on Thanksgiving Day when the 111-mile run over Pennsylvania hills, a Hudson 6-54 carried off first honors by a narrow margin over a Buick six. A Hudson 6-40 finished third and a Haynes six fourth.

The trip included a route from Harrisburg to Gettysburg, Abbottstown, York, Columbia and Elizabethtown. An average speed of 18 miles an hour was set, but nearly every car made the trip in an average better than 20 miles an hour. The cars were examined, weighed and filled early in the morning by a technical committee under the supervision of Referee W. R. Douglas. Atlantic Refining automobile gasoline of 63-64 gravity was used.

The awards were made according to the weight carried for the gasoline consumed and the heavier loaded cars had something on their lighter rivals. Honors for gasoline consumption went to a little Metz roadster with an average of 32.9 miles to a gallon, but in the touring car class an Overland took first honors with 26.9 miles. The Haynes sixes also made splendid records. Much interest centered in the Cadillac eight, which made an average of 16.9 miles to a gallon. An Autocar truck with passengers also made a successful trip.

The cars that checked at the final control and their records are given in the accompanying table.

Trucks to Be Exhibited at Detroit Automobile Show

DETROIT, MICH., Nov. 30—The annual automobile show of the Detroit Automobile Dealers' Assn. will be held in the plant of the Detroit Lumber Co., West Jefferson avenue, between Campbell and Junction avenues, January 16 to 23.

The building where the show was held in former years was found entirely inadequate for the ever-increasing automobile industry and it was not deemed advisable to take several buildings located far from each other.

The local show will be held in two buildings separated from each other by only 30 feet. The first building from Jefferson avenue, which will be reached from a 100-foot covered walk, is a frame structure one story high, 210 by 136 feet. The trucks, delivery wagons, traction engines, marine motors and motor boats are to be shown there also, and, if possible, the latest Wright biplane. The main building is a three-story concrete structure with two floors 210 by 138 and the third floor 210 by 40. The passenger cars and the accessories are to be shown on the first two floors, all the stands for parts and accessories being against the walls.

The third floor will have a café, a cabaret and a dancing pavilion.

One of the features of the show is to be a historical section in the main building where manufacturers will be urged to show their earliest models, either of passenger or of racing cars. Oldfield has promised to have his famous "999" on display and the Winton company is to send its Winton Bullet.

J. C. Ayres, Detroit manager of the General Motors Truck

Scores of Cars in Economy Contest of Harrisburg, Pa., Motor Club

Car	Entrant	Weight	Carbureter	Bore	Stroke	Cylr.	Gas consumed gal.	qt.	pt.	M.P.G.	Percentage by weight
Hudson 6-54	F. O. Horting	5,750	Zenith	4⅛	5½	6	5	1	¼	21.0	.11757
Buick Six	G. B. Zech	5,510	Marvel	3¾	5	6	5	0	1	21.7	.12178
Hudson 6-40	I. W. Dill	4,425	Zenith	3½	5	6	4	3	1¼	22.6	.14192
Haynes	A. McElwain	3,980	Rayfield	3½	5	6	4	2	½	24.3	.14674
Cadillac	Crispen Motor Car Co	5,582	Cadillac	3⅛	5⅛	8	6	2	½	16.9	.15193
Overland No. 81	A. Redmond	3,500	Schebler	4	4½	4	4	0	1	26.9	.15555
Haynes	Harrisburg Auto Co	4,100	Rayfield	3½	5	6	5	0	0	22.2	.15609
Overland No. 80	A. Redmond	3,920	Schebler	4⅛	4½	4	5	3	0	19.3	.16225
Paige	G. R. Bentley	4,030	Stewart	4	5	4	6	1	0	17.8	.19859
Hupmobile	Ensminger Motor Co	3,465	Zenith	3¼	5½	4	6	⅗	0	18.0	.22770
Jeffrey	C. H. Conrad	3,890	Stromberg	3	5½	6	7	0	0	15.8	.23033
Metz	Monn Bros.	1,805	Holly	3¾	4	4	3	1	⅜	32.9	.23823
Autocar Truck, 1½-ton	A. Redmond	5,475	Stromberg	4⅜	5	2	10	0	0	11.1	.23379

Co., is in charge of the truck section and it is reported that thus far manufacturers of the Buick, Commerce, Federal, General Motors Truck, Packard, Pierce and Standard trucks have applied for space.

Eleven More Exhibitors for Big Shows

NEW YORK CITY, Nov. 28—More accessory exhibitors for the Fifteenth National Automobile Shows in the Grand Central Palace, New York, and the Coliseum and First Regiment Armory, Chicago, next January have been allotted space. During the past week room for the following concerns were found at both shows: Cox Brass Co., Albany, N. Y., and the Standard Roller Bearing Co., Philadelphia, Pa. Additions to the New York show only include the Commercial Lubricating Co., Meadow and Jackson streets, Philadelphia, Pa.; B. W. Spitter, Dorchester, Mass.; Mutual Auto Accessory Co., 58 W. Sixty-fifth street, New York; Zenith Carbureter Co., Detroit, Mich.; New York Sporting Goods Co., 15 Warren street, New York; Dujardin Rubber Co., Brooklyn, N. Y.; Hampton Kerosene Carbureter Co., 1876 Broadway, New York, and Van Norman Machine Tool Co., Springfield, Mass.

There is still some space being made available in Grand Central Palace, New York, but the Chicago buildings are about filled to capacity.

Germany's Export Trade—1912 Foreign Business

(*Continued from page* 1013)

many and one eight from the United States. The statistics for the years from 1909 to 1912 inclusive are:

PASSENGER CARS

	1912	1911	1910	1909
63	$1,665,000	$671,750	$313,000	$35,750

COMMERCIAL VEHICLES

44	411,500	155,000	111,250	48,000
07	$2,077,500	$826,750	$424,250	$83,750

PARTS

..	*$349,250	.....	.....	.....

*Of which $216,750 for automobile tire covers and tubes.

MOTORCYCLES

97	$21,250	$8,000	$6,500	$3,250

British India Important

The British India business is becoming more and more important every year. During the last 7 years ending March 31, 1914, the total value of the cars and parts imported, according to British reports, was $21,055,000 of which $2,110,000 was credited to the year 1907-1908 and $5,750,000 to the year 1913-1914. Exports from Germany for 1909, 1910, 1911 and 1912 were:

PASSENGER CARS

	1912	1911	1910	1909
48	$83,250	$47,750	$56,000	$20,000

MOTORCYCLES

22	$4 000	$6,250	$3,500	$5,000

PARTS

...	*$312,500	....	....	....

*Including automobile covers and tubes for $176,250.

A $4,275,000 Total

During the 12 months ending March 31, 1914, there were imported a total of 4,419 motor cars and motorcycles, having a total value of $4,275,000, while during the 12 months ending March, 1913, the total was 3,089 cars and motorcycles, having a value of $2,985,000. Out of the 2,880 passenger cars and seventy-six commercial vehicles imported in 1914, 1,669 of the former and forty-two commercial vehicles came from Great Britain, whose share out of the total imports in 1914 was $3,035,000 or three-quarters of the total imports.

The average value of the British car or chassis imported was $1,540, while the average value of the other foreign cars imported was $1,000.

The value of the imports from other countries in 1914 was $370,000 for the United States; $265,000 for Germany; $240,000 for Belgium; $165,000 for France, and $15,000 for Italy.

Germany's Australasian Share $1,000,000

While total value of the German cars, parts, motor cycles imported into Australasia in 1912 represent a value of a little more than $1,000,000, the total value of these imports from all countries of the world totaled very nearly $9,000,000. The appended chart gives the total value for chassis or complete cars, automobile bodies only, and motorcycles and all parts, either for cars or motorcycles. The total value of imports into Australasia are:

CHASSIS OR COMPLETE CARS

1912	1911	1910	1909	1908
$7,257,475	$5,090,109	$3,471,230	$2,177,570	$1,414,515

BODIES

1,100,440	$02,710	480,015	313,210	215,990

MOTORCYCLES AND PARTS

623,270	292,280	229,505	168,290	90,750
$8,981,185	$6,185,090	$4,181,150	$2,659.070	$1,721,255

England has been the biggest supplying country for Australasia. The United States are second on the list, then comes France, Belgium, Italy, Canada, Germany, as far as the imports during the first 6 months of 1912 indicate.

$2,889,620 South Africa's Total

The total value of the automobiles and automobile parts imported into South Africa in 1912 was $2,889,620 of which $1,549,575 is credited to Great Britain, while the United States are next with the total of $720,025. Canada follows with $251,110, then comes Germany with imports totaling $166,960, then France and Italy.

The total value of the motorcycles and motorcycle parts imported in 1912 was $771,180 of which $682,765 is to the credit of the British manufacturers. Germany follows, then France and the United States.

The increase of the automobile imports in 1912 over 1911 represents in value more than $1,000,000 while the motorcycle imports increased by over $400,000.

British consular reports give some interesting data about the imports of chassis and bodies into New Zealand for the years 1910 to 1913 and, while the details per country are not shown, it will allow those interested to get a good idea of the increasing business in that country.

CHASSIS

Year	Number	Total Value	Average Value
1910	772	$900.325	$1,166
1911	1,524	1,581,925	1,030
1912	2.340	2,113 300	903
1913	2,428	2,199,610	906
Total	7,064	$6,795,160	962

BODIES

1910	726	$206,250	284
1911	1,473	433,625	294
1912	2,265	697,115	307
1913	2,331	712 815	305
Total	6,795	$2,049,805	301

The imports of chassis from the United States increased in value from $96,607 in 1910 to $438,983 in 1911 and to $681,269 in 1912. During those 3 years the imports from Great Britain increased respectively from $126,586 to $905,692 in 1911 and to $957,097 in 1912. Thus the American business increased nearly $250,000 in 1912 as against an increase of only $50,000 for the British business. The imports of cars and parts from the United States represented nearly one-third out of the total imports in 1912.

Factory Miscellany

WILL Enlarge Hudson Factory—Evidence of satisfactory business conditions is shown by the announcement of additions to be made to the factory of the Hudson Motor Car Co., Detroit. It has, therefore, been decided to add a third story to the main factory building and to three of the largest wings, an addition of floor space 2,200 feet long by 60 feet wide. In construction the addition will conform to the present style of pressed brick and concrete. Work on the additional story will begin at once. It is to be completed on March 1, 1915.

Sevison's $5,000 Fire Loss—The factory of the Sevison Electric Co., Elkhart, Ind., maker of automobile fixtures, suffered $5,000 loss from fire November 17.

Xenia Rubber Adding—The Xenia Rubber Co., Xenia, O., is installing a new mill at its plant on West Main street which will increase the factory of the plant four or five times.

Morrill & Morley Move—The Morrill & Morley Co., Benton Harbor, Mich., manufacturer of automobile parts and spray pumps, has moved into its new plant and is now also making automobile body castings.

Chester Co. to Make Trucks—The Chester County Motor Co., Coatesville, Pa., has increased its captial stock to $500,000 and plans the construction of a factory for the manufacture of commercial trucks. J. Edwin Brinton is president.

Mercury Cyclecars at $200.—The Michigan State Auto School, 11 Selden avenue, Detroit, Mich., which has purchased the Mercury Cyclecar Co., will continue to make the Mercury cyclecars. They will be sold at $200 instead of $375, the old price.

Louisville Co. to Make Inner Tubes—The Southern Rubber Products Co., Louisville, Ky., has been incorporated with $25,000 capital stock by A. F. Wolke and others and will establish a plant for the manufacture of inner tubes for automobiles.

Silver Ray Makes Lamps—The Silver Ray Lamp Co., Cleveland, O., recently incorporated, has leased a two-story building from the Cleveland Fixture Co., 1315 East 40th street, and will install a factory for the manufacture of automobile lamps.

New Truck Factory in Columbus—It is reported that Weller & Thomas have had plans prepared for a motor truck factory, 100 by 190 ft., two stories, of brick construction, to be erected at Columbus, O. J. A. Thomas, 287 Dryden avenue, Zanesville, O., can furnish full particulars.

Stutz Buys Two Lots—The Stutz Motor Car Co., Indianapolis, Ind., has bought two lots adjoining its plant on the north at Tenth street and Capitol avenue, to provide for further expansion. The lots front 100 feet in Capitol avenue and have a depth of 208 feet. The consideration was $10,000.

Ford Plant Ready in January—The Ford Motor Co. expects to have its assembling plant in Atlanta, Ga., now in course of construction at Ponce de Leon avenue and the Southern railway belt line, completed by the middle of January. The Ford people will employ some 200 or 300 men in the new plant and will materially increase the banking business of Atlanta's banks, as well as add the spending capacity of its help to the city's mercantile business.

Gallup in New Tire Co.—E. E. Gallup, of the Gallup Rubber Co., Pittsburgh, Pa., and several associates have arranged for the purchase of a large manufacturing location in the southwest part of Minerva, O. It is the intention of the company to immediately begin the erection of a large rubber and automobile tire plant with a capacity of 500 casings and inner tubes per day, demanding the employment of from 300 to 500 men. The company that will in all probability be incorporated under the laws of Ohio with a capitalization of $200,000, will be named in honor of Minerva as the Minerva Rubber Co.

Maxwell Charters Boat for Shipment—Recently the Maxwell Motor Co., Detroit, Mich., chartered the White Star Line steamer Wauketa to carry fifty Maxwell cars to its Toledo distributors, Landman & Griffith. It is claimed that this is the first time that an entire boat load of automobiles have been shipped by one concern.

Midgley Tires in December—The Midgley Tire & Rubber Co., Lancaster, O., is busily engaged in installing the calender, the last piece of mill machinery to arrive. This piece of machinery is to roll the rubber into strips. The boilers and engine are all ready to run, although several small pipes are yet to be connected. While the plant will likely be running by December 1, no tires will be produced until the 15th, it is believed.

Universal Oxygen Doubling Output—The Universal Oxygen Co., Sheboygan, Wis., which established a plant for the production of gas for concerns operating welding and cutting apparatus about 8 months ago, is preparing to double the output. For 2½ months the plant has been working day, night and Sunday shifts and the monthly production of gas has reached nearly 90,000 cubic feet. This is being shipped in steel drums to all parts of the country. Until recently the supply of containers was derived from Germany, but this has now been stopped by the war and in doubling the size of the gas producers, the company is planning to add a machine shop for the manufacture of drums. About 1,500 German-made drums are now in use. The company operates under the Rowlands-Mueller gas producer patents.

The Automobile Calendar

Dec. 1-4.....New York City, Annual Meeting of the American Society of Mechanical Engineers.

Dec. 12-19.....Akron, O., Show, Akron Auto Show Co., O'Neill Bldg.

Dec. 14-18.....Chicago, Ill., American Good Roads Congress.

Jan. 2-9.....New York City, Annual Automobile Show, Grand Central Palace.

Jan. 2-9.....New York City, Automobile Salon, Grand Ball Room of Astor Hotel, Automobile Importers' Alliance, E. Lascaris, Pres.

Jan. 5-7.....New York City, Engineering Societies' Bldg., Winter Meeting Society of Automobile Engineers.

Jan. 9-16.....Philadelphia Show, Metropolitan Bldg., Philadelphia Auto. Trade Assn.

Jan. 16.....Detroit, Mich., Show.

Jan. 16-23.....Cleveland, O., Show, Cleveland Automobile Show Co., F. H. Caley, Mgr.

Jan. 23-30.....Chicago, Ill., Automobile Show, First Regiment Armory.

Jan. 23-30.....Montreal, Que., Show, Allen Line Liverpool Bldgs., Montreal Automobile Trade Assn., T. C. Kirby, Mgr.

Jan. 25-30.....Fall River, Mass., Show.

Jan. 25-30.....Buffalo, N. Y., Show, Broadway Auditorium, Buffalo Automobile Dealers' Assn.

Jan. 30-Feb. 6....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Automobile Trade Assn.

Feb.....Portland, Ore., Show, Portland Auto. Trade Assn.

Feb.....Toledo, O., Show, Toledo Auto Show Co.

Feb. 15.....Grand Rapids, Mich., Show, Klingman Furniture Exposition Bldg., Grand Rapids *Herald*, C. S. Merriman.

Feb. 15-20.....Omaha, Neb., Show, Auditorium, C. G. Powell.

Feb. 22.....San Francisco, Cal., Vanderbilt Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.

Feb. 23-27.....Ft. Dodge, Ia., Show, Armory, C. W. Tremain, Sec.

Feb. 23-27.....Syracuse, N. Y., Show, Syracuse Auto Dealers' Assn.; H. T. Gardner, Mgr.

Feb. 27.....San Francisco, Cal., Panama-Pacific Exposition, Grand Prize Race, Panama - Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.

Mar. 6-13.....Boston, Mass., Show, Mechanics Bldg., Boston Auto Dealers Assn., Boston Commercial Motor Veh. Assn.

Mar. 9-15.....Des Moines, Ia., Show, C. G. Van Vliet.

Mar. 14.....San Francisco, Cal., Panama - Pacific Cup Race, Panama - Pacific Exposition Grounds; Promoter, Panama - Pacific Exposition Co.

April.....Calumet, Mich., Show, Coliseum.

May 29.....Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.

Sept. 20-25.....San Francisco, Cal., International Engineering Congress.

The Week in the Industry

Motor Men in New Roles

AUGHE Chalmers Treasurer—H. J. Aughe has been elected treasurer of the Chalmers Motor Co., Detroit, Mich., succeeding C. A. Pfeffer, who was recently appointed assistant general manager.

Mr. Aughe has been associated with the company for the past 6 years and has won his way from the clerical ranks of the treasurer's department to his present position. He was previously general auditor. He assumes the duties of treasurer immediately.

Hopkins Heads Cadillac in Atlanta—Lindsey Hopkins will become on or about December 1 executive head of the Atlanta Cadillac Co., Atlanta, Ga.

Jessup District Sales Manager—C. A. Jessup has been made Southern district sales manager for the Kelly-Springfield Tire Co., with headquarters in Los Angeles, Cal.

Jackson Resigns from Bailey Electric—L. B. Jackson, chief engineer of S. R. Bailey & Co., Inc., Amesbury, Mass., has resigned. His future plans are not definitely decided.

Loomis Heads Southern Motors—G. S. Loomis, formerly department head in the sales division of the Packard Motor Car Co., Detroit, Mich., is now general manager of the Southern Motors Co., Louisville, Ky., one of the most important automobile business concerns in the South and which handles the Packard, Hudson, Dodge gasoline cars and Detroit electrics.

Copley Franklin's Spokane Manager—L. B. Copley arrived in Spokane, Wash., during the past week to take the management of the Franklin Auto Sales Co., distributor of the Franklin car and Kelly-Springfield trucks.

Allyn Tacoma Speedway Pres.—At the annual meeting of the Tacoma Speedway Assn., Tacoma, Wash, Frank Allyn was re-elected president; F. E. Jeffries, vice-president; H. E. O'Neal, treasurer, and George Dunn, secretary.

Harshberger J.-M. Agent—The H. W. Johns-Manville Co. has named Z. F. Harshberger its agent for Indiana, with headquarters in Indianapolis. Under the Indiana law an outside corporation must name an official agent upon whom court papers may be served.

Brown Seattle Firestone Manager—C. W. Brown, for several years a member of the Firestone sales staff in San Francisco and formerly manager of the Oakland branch of the Continental Tire Co., has been named manager of the Seattle branch of the Firestone Tire & Rubber Co., succeeding Ed. L. Campion, who resigned to become sales manager of the Marathon Tire Co.

Lemley Seattle Manager—G. G. Lemley, for 2 years purchasing agent and treasurer of the automobile and accessory firm of Ballou & Wright, has been named manager of the Seattle, Wash., store of the company, succeeding A. H. Jones, who has retired to devote his time to developing a new non-skid tire.

Jack's Former Position—It was stated in these columns last week that R. F. Jack, formerly assistant chief engineer of the Cadillac Motor Car Co., Detroit, had been appointed chief engineer of the Russell Motor Car Co., Ltd., Toronto, Ont. The name should have been R. K. Jack and his former position was assistant to the Cadillac chassis engineer, Mr. Snell.

Bauer Edison's Chicago Manager—F. Bauer has been appointed manager of the Chicago office, Edison Storage Battery Co., Orange, N. J., succeeding C. B. Frayer, who retired November 30 to devote himself to private interests. Mr. Bauer has been with the Edison company about a year as assistant manager of the railway department. He is president of the Railway Electrical Supply Manufacturers Assn., an organization in which he has been active since its formation.

Recent Incorporations in the Automobile Field

Canada

QUEBEC—Safety Tire Co.; capital, $1,000,000; to manufacture wheels, rims, tires, etc. Incorporators: Joseph G. Frenette, Arthur Moisan, Ernest Taschereau and others.

SUMMERSIDE, P. E. I.—Canadian Auto-Pneumatic Pump & Machinery Co.; capital, $35,000. Incorporators: J. A. Van Tilburg, F. A. Johnson and D. A. Pickering.

TORONTO, ONT.—Anglo-Canadian Motor Sales Co.; capital, $50,000; to manufacture and deal in automobiles. Incorporators: A. G. Browning, A. Fry, G. E. Buchanan, all of Toronto.

Connecticut

STAMFORD—Motor Sales Co.; capital, $50,000. Incorporators: Allen Selden, A. K. Shaw and Floyd Bartram, all of Stamford.

WATERBURY—International Top Co.; capital, $100,000; to manufacture automobile tops. Incorporators: W. R. Upson, A. W. Chenoweth, G. W. Seaton.

Delaware

WILMINGTON—Pneumatic-Hub-Tire-Wheel Co.; capital, $500,000; to manufacture motor car wheels and tires. Incorporators: G. J. Lampton, N. M. Rowland and L. C. Evans, all of Louisville, Ky.

Illinois

CASEY—K. L. Mfg. Co.; capital, $100,000; to manufacture gasolene dispensers. Incorporators: W. B. Linn, C. E. Bennett and J. H. Barker, all of Casey.

CHICAGO—Advance Garage Co.; capital, $2,500; to manufacture and deal in, store and repair motor vehicles. Incorporators: Samuel Topliff, Sigrid Erickson and Homer H. Cooper.

CHICAGO—Automobile Securities Co.; capital, $2,500; to deal in, repair and rebuild motor cars, parts and accessories. Incorporators: H. T. Potter, K. M. Lorenz and L. I. Bretz.

LIBERTYVILLE—Maher Mfg. Co.; capital, $50,000; to manufacture and deal in motor car accessories, lighting fixtures, etc. Incorporators: Nathan L. Maher, Lucas W. Maher and Elton C. Armitage.

Indiana

SOUTH BEND—Standard Auto Supply Co.; capital, $10,000; motor car supplies. Incorporators: Ignatius K. Werwinski, James E. Scott, Joseph Kish, Jr., Julius Fodar and Charles Jones.

SOUTH BEND—South Bend Garage Co.; capital, $5,000. Incorporators: A. D. Parker, G. W. DeClements, D. C. Rogers.

Kentucky

LOUISVILLE—Falls City Auto Co.; capital, $6,000; to supply automobile hearses and carriages for funerals. Incorporators: E. C. Pearson, S. J. McElliott, John Schlidt, Henry Bosse, L. E. Cralle.

PADUCAH—Baker Auto Co.; capital, $5,000; to deal in automobiles. Incorporators: C. N. Baker, E. M. Baker, E. H. Boss.

Massachusetts

BOSTON—Needham Tire Co.; capital, $350,000; to manufacture automobile tires. Incorporators: J. S. Patterson, and others.

Michigan

DETROIT—Electric Welder Co.; capital, $50,000. Incorporators: A. W. Mairs, William F. Schultz, A. F. Sellers and E. A. Buckman.

DETROIT—Michigan Storage Battery Co.; capital, $50,000; to manufacture storage batteries. Incorporators: L. C. and S. G. Knop, N. T. Lawson.

DETROIT—Park Motor Works; capital, $5,000. Incorporators: George Gilmore, Clarence G. Hill and Agnes Callahan.

DETROIT—Rob Roy Mfg. Co.; capital, $20,000; to manufacture motor car parts. Incorporators: Robert Wachman, A. Leroy May, Harry Katz, Gilbert Holmwood, Henry Platz and William E. Burns.

DETROIT—Wolverine Motor Specialty Co.; capital, $1,000; to deal in motor car supplies. Incorporators: Ada S. and Roy W. Kumler and Chas. R. Robertson.

SAGINAW—Letts Auto & Taxi Co.; capital, $7,500; general motor vehicle business. Incorporators: William F. and Charlena D. Letts.

Minnesota

MINNEAPOLIS—Brasie Motor Car Sales Co.; capital, $50,000; deal in automobiles. Incorporators: C. H. Walker, Ole Martinson, Oscar Hellum.

MINNEAPOLIS—Hartsough Tractor Co.; capital, $1,000,000; to manufacture the Lion tractor, a new two-wheel engine invented by D. M. Hartsough.

MINNEAPOLIS—Jackson Motor Co.; capital, $15,000; to deal in automobiles. Incorporators: Fred Darling, N. S. Davis, A. A. Wilson.

MINNEAPOLIS—Simplex Tractor Co.; capital, $250,000; to manufacture tractors. Incorporators: J. W. Muir, G. H. Wilson, C. E. Cottrell, H. J. Hollister.

MINNEAPOLIS—Young Motor Sales Co.; capital $50,000; deal in automobiles. Incorporators: E. N. Young, H. J. Murphy, F. N. Furber.

Missouri

ST. LOUIS—East Side Motor Truck, Transfer & Baggage Co.; capital, $2,000. Incorporators: A. O. Middleton, E. K. Brown and John O. Schwaner.

ST. LOUIS—More Automobile Co.; capital, $15,000; to manufacture, sell, deal in and repair motor cars and accessories. Incorporators: Edward A. More, John B. Strauch, John T. Salisbury and Cyrus B. More.

North Dakota

BISMARCK—Missouri Valley Motor Co.; capital, $25,000; general motor vehicle business. Incorporators: Louis A. Tavis and Joseph P. Hess, both of Mandan; Howard H. Moore, Minneapolis, Minn.

WILLISTON—Williston Motor Co.; capital, $25,000; to deal in motor cars. Incorporators: C. A. McKinney, F. N. Fuller and M. L. McKinney, all of Williston.

New York

BROOKLYN—Hanson Peacock Corporation: capital, $1,000; to manufacture motors, tires, etc. Incorporators: Joseph L. Young, 209 Adelphi street; Selma Hietenstein, 841 Beck street; E. Katherine Payne, 430 Main street, New Rochelle.

BROOKLYN—Overfield Auto Co.; capital, $1,000; to deal in motor cars. Incorporators: Ferris A. Overfield and Eda D. Overfield, both of 204 Sunnyside avenue; George S. Hice, 43 Jerome street.

BROOKLYN—Arthur R. Tator Co.; capital, $1,000; to deal in motor cars, tires, etc. Incorporators: Arthur R. Tator, 1051 Prospect place; Hugh Foster 617 McDonough street; John F. Undutsch, 1051 Halsey street.

BUFFALO—Western Sales Corporation; capital, $15,000; to manufacture and deal in tire fillers, motor car accessories, etc. Incorporators: Charles H. Taylor, Thomas Catlin and Sherman A. Hooker, all of 1330 Marine Bank building.

NEW YORK—Fireproof Garage Co.; capital, $5,000; to operate a garage. Incorporators: James R. Pierson and Samuel Riger, both of 29 Broadway; Thomas McD. Caffrey, Hohokus, N. J.

NEW YORK—Globe Garage Co.; capital, $3,000; to operate a garage. Incorporators: Philip Lauter, 813 E. 163rd street; Ignatz Lauter, 152 W. 90th street; Morris M. Gruber, 800 E. 168th street.

Automobile Agencies Recently Established

PASSENGER CARS

California

Berkeley	Oldsmobile	G. W. Rodehaver
Coalinga	Oldsmobile	Martin's Garage
Hanford	Oldsmobile	Marak & Hayes
Hollister	Oldsmobile	Hollister Auto & Mch. Co.
Los Angeles	National	Hawley, King & Co.
Oakland	Detroit	Electric Vehicle Co.
Oakland	Oldsmobile	R. W. Drum
Rialto	Moon	B. Buxton
Richmond	Oldsmobile	Hayes & Hopping
San Francisco	Detroit	Electric Vehicle Co.
San Pedro	Moon	Pacific Garage
Santa Ana	Cole	Wisdon & Co.
Santa Monica	Oldsmobile	R. C. Silvernale
Ventura	Moon	C. H. Judd

Canada

Dawson City, Yukon Territory	Franklin	Peter Rost
Montreal	Saxon	The Stockwell Motor Co.
Montreal	Hupp	The Gareau Motor Car Co.
Regina	Franklin	Store & Company
Shaunavon	King	Locklin & Eckhart
Sherbrooke	Saxon	Cadillac Motor Sales Co.
Underwood	Saxon	Roppel Bros.
Winnipeg	Briscoe	Jos. Maw & Company
Winnipeg	Peerless	Jos. Maw & Company
Winnipeg	English Wolseley	The Breen Motor Co.

Colorado

Denver	Stearns-Knight	A. K. Vickery
Denver	Chevrolet	H. E. Maines
Denver	Zip	Carl Johnston
Grand Junction	Saxon	Western Slope Auto Co.

Connecticut

Bridgeport	Scripps-Booth	Arthur L. Clark Co.
Bristol	Moon	L. B. Snyder
Hartford	Scripps-Booth	Universal Auto Co.
New Haven	Scripps-Booth	The Holcomb Co.
New Haven	Apperson	N. B. Whitefield
Norwalk	Oldsmobile	O. H. Banks Co.
Stamford	Moon	H. R. Hendrie

Delaware

Wilmington	Dodge Bros.	Cahill & Co.
Wilmington	General Motor Truck	Hansen Automobile Co.
Wilmington	Grant	French Street Garage

Florida

Dade	McFarlan SIX	S. M. Tatum
Gainesville	Overland & Maxwell	Coite W. Hill
West Palm Beach	McFarlan SIX	S. M. Tatum

Georgia

Atlanta	Scripps-Booth	S. E. Davidson
Cornelia	Saxon	The Cornelia Garage
McDonough	Saxon	Smith & Amis
Savannah	Saxon	Savannah Motor Car Co.

Illinois

Abingdon	Oldsmobile	C. G. Slough & Co.
Aledo	Moon	J. L. Buckley
Barry	Moon	H. M. Royalty Co.
Batavia	Cole	Lundeen & More
Bloomington	Ford	Blair & Lockwood
Bloomington	Oldsmobile	Trott & Stubblefield
Dana	Glide	H. Koensgen & J. J. Klesath
Freeburg	Moon	X. H. Heiligenstein
Freeport	Oldsmobile	Maurrer Bros.
Joliet	Moon	Goodwin & Hill
Lakewood	Glide	L. B. Morgan
London Mills	Glide	E. E. Terwilliger
Marissa	Moon	J. A. Hamilton
Pearl City	Oldsmobile	J. M. Aurand
Polo	Oldsmobile	J. T. Mulnix, Jr.
Robinson	Moon	G. M. Allison
Rushville	Glide	R. A. Lawler
San Jose	Moon	Fred. Zimmerman
Witt	Reo	W. S. Baxter

Indiana

Logansport	Oldsmobile	Oakland Motor Co.
Marion	Franklin	M. L. Swayzey

Iowa

Algonia	King	Wilson Motor Co.
Bloomfield	Moon	Bruce & Bonar
Boise	King	Howard Hunter
Cedar Rapids	King	Hawkeye Dis. Co.
Colo	Moon	R. W. Bronhard
Des Moines	Oldsmobile	Iowa Oldsmobile Co.
Des Moines	Saxon	Payne Motor Co.
Dodge	Paige	E. Kubuck
Eagle Grove	Moon	Wm. Fletcher
Livermore	King	Carl Weise
Malcolm	King	Malcolm Garage
Milton	Moon	Moon Auto Co.
Monroe	Saxon	J. Lowe
Nevada	King	Nevada Auto Co.
Radcliffe	Glide	Glide Auto Co.
St. Anthony	Glide	J. Mayer & Son
Sigourney	Oldsmobile	Dupuis & Freres
Sioux City	Glide	Glide Motor Car Co.
State Center	King	Eckhart & Hilliman
Story City	Glide	Alsvig & Thompson
Traer	Oldsmobile	Jasper Wilson
W. Burlington	Glide	E. Rheinschmidt
Wellsburg	Moon	D. J. Riekena
Zearing	King	Hease Bros.

Kansas

Gorham	Oldsmobile	T. M. French
Jennings	Oldsmobile	Smith & Feely

Kentucky

Eminence	King	D. L. Rickett
Hopkinsville	Oldsmobile	Hopkinsville Cadillac Co.
Louisville	Peerless	Yager Motor Car Co.
Louisville	Briscoe	Louisville Motor Co.
Mayville	Oldsmobile	J. D. Keith

Louisiana

Fullerton	King	H. S. Anderson, Jr.

Maryland

Baltimore	Scripps-Booth	Randall Mfg. Co.

Massachusetts

Boston	Paige	Paige Motor Car Co.
Boston	Rauch & Lang	Rauch & Lang Co.
Boston	Peerless	Beacon Motor Car Co.
Boston	Pullman	Leo W. Schlegmelmilch
Boston	Scripps-Booth	Franklin Motor Car Co.
Brockton	Oldsmobile	L. J. Jazelton
Haverhill	Studebaker	Ellison Motor S. Co.
Malden	Haynes	W. M. Bean
New Bedford	Scripps-Booth	S. C. Lowe Supply Co.
Newburyport	Studebaker	James Dickens
North Adams	Ford	Van Sleet Motor Co.
Somerville	Ford	Hill-Michie Co.
Springfield	Jeffery	Hampden Auto Co.
Taunton	Saxon	H. C. Perry
Wakefield	Saxon	J. E. Pray
Worcester	Maxwell	L. J. Rondeau
Worcester	Oldsmobile	J. M. Slattery & Co.
Worcester	Pullman	Peter Welin
Worcester	Vim	Franklin Square Garage

Maine

Houlton	Oldsmobile	G. H. Wiggins
Portland	Case	Taxicab Service Co.
Portland	Scripps-Booth	Franklin Motor Car Co.
Rockland	Oldsmobile	C. Doherty

Michigan

Adrian	Oldsmobile	S. W. Raymond Auto Sales Co.
Battle Creek	Saxon	American Motor Co.
Big Rapids	Ford	L. F. Berteau
Big Rapids	Studebaker	L. F. Berteau
Bronson	Buick	Carl & Holcomb
Caledonia	Studebaker	Roy Dodge
Calumet	Imperial	Weider Harness Co.
Flint	Oldsmobile	Marshall Auto Co.
Flint	Saxon	Bowler Auto Sales Co.
Grand Rapids	Dodge Bros.	Valley City Motorcar Co.
Grand Rapids	Franklin	The Security Auto Sales Co.
Grand Rapids	Franklin	Sanders & Jackson
Ionia	Oldsmobile	E. H. Kerstetter
Kalamazoo	Oldsmobile	Newton Root
Ludington	Oldsmobile	Ludington Auto & S. Co.
Muskegon	Oldsmobile	Koelber-Bennett Auto & S. Co.
Newaygo	Oldsmobile	Koelber & Bennett Auto Co.
Oceana	Oldsmobile	Koelbel & Bennett Auto Co.
Ottawa	Oldsmobile	Koelbel & Bennett Auto Co.
Port Huron	Dodge	Frank S. Church
Port Huron	Cadillac	Frank S. Church
Sheboygan	Oldsmobile	Schulz Bros. Garage
South Haven	Ford	Christian Niffenegger
Traverse City	Oldsmobile	W. Michigan Garage
Traverse City	Maxwell	P. Burden & John Ott

Minnesota

Austin	Oldsmobile	Laman A. Mott
Brewster	Oldsmobile	J. C. Ahrens
Chatfield	Oldsmobile	Smith & Woodruff
Duluth	King	Burton Sykes
Fergus Falls	Oldsmobile	Bergerud & Miller
Lanesboro	Oldsmobile	Christenson & Lund
Minneapolis	Ohio Electric	Minneapolis Battery Co.
Minneapolis	Davis	White Garage
Minneapolis	Vulcan	Metropolitan Motor Co.
St. James	Oldsmobile	Schoffman & Crowley
Thief River Falls	Oldsmobile	Weiland & Crandall
Webster	King	W. Keske

Mississippi

Indianola	Oldsmobile	I. D. Benson
Merigold	Oldsmobile	Guy E. Waldrop

Missouri

Bolckow	Moon	G. E. Middleton
Columbia	Reo	J. N. Taylor
Higginsville	Cole	Emil C. Lefmann
Huntsville	Reo	J. N. Taylor
Kansas City	Cole	Myers Ebersole Motors Co.
Macon	Reo	J. N. Taylor
St. Charles	Moon	Hy Werminghaus
St. Joseph	Imperial	The Grand Center Motor Co.
St. Joseph	Empire	Weider Harness Co.
St. Joseph	Moon	J. A. Suddarth & Co.
St. Joseph	Briscoe	Leslie Motor Car Co.
St. Louis	Maxwell	Johnston Auto. Co.

Montana

Fallon	King	Carl Anderson
Malta	Franklin	Shody & LeVesconte

Nebraska

Columbus	Paige	J. Luxa
Friend	Hupmobile	Wm. Vossler
Grand Island	Cole	Brandes Motor Car Co.
Lincoln	Oldsmobile	E. A. Everett
Norfolk	Oldsmobile	E. A. Harms
York	Chandler	E. S. Clarke

New Hampshire

Dover	Pullman	George Athorn
E. Haverhill	Saxon	H. D. Gannett

New Jersey

Frenchtown	Saxon	T. W. Zillstorff
Newark	Scripps-Booth	Light Car Distributing Co.
Plainfield	Oldsmobile	O. A. R. Motor Co.
Trenton	Franklin	Richards & Sykes

New Mexico

Santa Fe	Oldsmobile	Auto Trouble Shop

New York

Albany	Scripps-Booth	Franklin Motor Car Co.
Albion	Krit	S. T. Strouse
Batavia	King	H. R. Langworthy
Binghamton	Moon	Binghamton Motor Car Co.
Brooklyn	Saxon	J. L. Peacock & Chas. Hanson
Canandaigua	Krit	Foley & Giddings
Canisteo	Krit	W. S. Meeks
Cohocton	Krit	M. C. Silsbee
Clyde	Krit	F. E. Finch
East Aurora	King	B. A. Burzette
Geneva	Oldsmobile	D. M. Dorman
Hilton	Krit	Jos. Ingham
Honeoye Falls	Krit	Jobes & Caggill
Hudson Falls	Oldsmobile	Smith & McCoy Motor Co.
Hudson	Saxon	H. L. Andrews
Ithaca	Franklin	H. L. Cobb
LeRoy	Krit	Ernest Townsend & S
Livonia	Krit	E. C. Stone
Lockport	King	A. L. Hoag
Lyons	Krit	P. Deutschler & Son
Nunda	Krit	P. J. Cuddebac
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Waterloo	Krit	Waterloo Auto Co.

North Carolina

Wilmington	Moon	J. B. Farmer

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Mandan	Oldsmobile	G. A. Dailey

Ohio

Ada	Franklin	Stample & Smith
Alliance	King	Alliance Motor & S.
Ashland	Oldsmobile	Curry & Roberts
Ashville	Studebaker	C. F. Brinker
Bucyrus	Krit	S. G. Hertz
Buffalo	Krit	A. S. Secrest
Canal Dover	Oldsmobile	Dover Auto Co.
Canton	Ford	Monnot & Sacher
Cardington	Allen	Buckingham Auto Co.
Cedarville	Allen	Nagley Bros.
Cincinnati	Hudson	Welbon Motor Car Co.
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Columbus	Stutz	Neil Auto Livery Co.
Columbus	Oldsmobile	W. W. Muzzy
Columbus	Moon	W. W. Muzzy Garage
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Findlay	Oldsmobile	Decker & Flinchbaugh
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Jessup	King	Miller Brothers
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Lima	Moon	Moon Garage
Logan	Allen	G. W. Stallsmith
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Louisville	Oldsmobile	Star Motor Car Co.
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Oak Harbor	Oldsmobile	G. L. Tilton
Prairie Depot	Oldsmobile	Harry Hoiles
Radnor	Allen	C. C. & D. F. Coonlite
Rushlyvania	Krit	L. W. Faucet
Springfield	Allen	The Nash-Baird Motor Car Co.
Steubenville	Oldsmobile	Steubenville H'dwar & S. Co.

Cold Weather Accessories for Motorists

Garage Heaters, Foot Warmers, Electric Mixture Heaters and Primers All Valuable to Winter Drivers

WITH the coming of Winter the automobilist naturally desires to fortify himself and the car against the ravages of the freezing weather. There are five kinds of heaters which he may use: the garage heater, which may be an ordinary stove or furnace, or a special gas heater of compact design built for the purpose; the electric mixture heater to insure easy starting; the radiator heater to prevent freezing; the foot warmer or car heater; the hand warmer.

Scientific Safety Garage Heater—A heater, Fig. 1, using gas as fuel and which will not set fire to inflammable vapors in the atmosphere, is made by the Scientific Heater Co., 1075 Power avenue, Cleveland, O. The device is made in three sizes: for garages 18 by 20 feet, 22 by 26 feet, and 26 by 36 feet. The respective prices are $25, $32.50 and $45. A larger garage may be heated by installing additional heaters.

A small pilot light just below the door of the heater is lighted during the first cold days of the season, and this becomes the control, no more matches being necessary.

Superior Safe Garage Heater—A garage heater made by the Superior Mfg. Co., N. S. Pittsburgh, Pa., and which operates on gas is shown in Fig. 2. It consists of a small furnace and a tubular radiator inside a heavy galvanized casing, the outside side dimensions of which are: length, 40; height, 33, and width, 12 inches. It is stated that the combustion chamber is so arranged that the gas is completely burned and none is wasted. Safety is secured by completely inclosing the combustion chamber from the outside air. The air to the heater is brought from outside the building through a suitable pipe and the burned gases are exhausted through a chimney pipe. The heater is lit at the beginning of the season and after that a small pilot light is kept burning continuously so that the heat may be turned on at any time afterwards without running the risk of lighting a match. The price is $25, f.o.b. Pittsburgh.

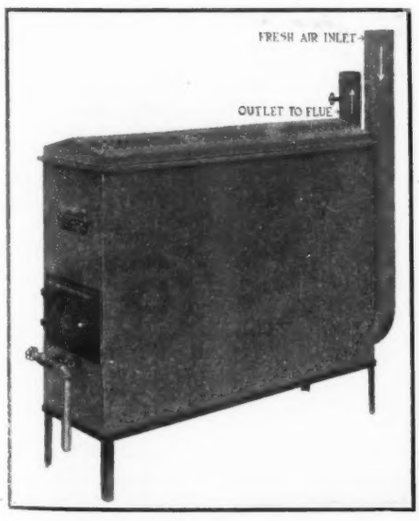

Fig. 2—Superior Safe garage heater

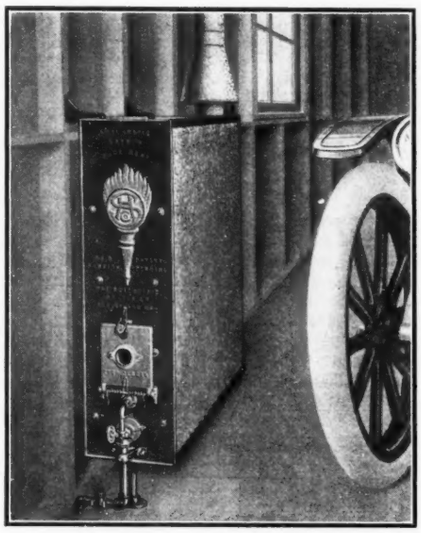

Fig. 1—Scientific Safety garage heater

Lehman Heater—A special form of coal is used in the heater shown in Fig. 3. This heater is made in various sizes and styles, and is offered at prices ranging from $1.75 to $10. As the heat comes from within and is not derived from the exhaust or cooling system, these foot warmers are easily portable and may be carried from one car to another. The fuel is made up into briquettes and is introduced into the heater by putting it into a drawer.

This heater is made by Lehman Bros., 10 Bond street, New York City.

Samson Foot Warmer—The American Electric Co., State and Sixty-fourth streets, Chicago, Ill., is manufacturing a foot warmer, Fig. 5, which uses a special form of fuel.

The device is easily portable. It is fireproof and the products of combustion are odorless. One filling of fuel will supply heat for over 6 hours. The warmer cannot be tipped over, and is provided with a handle for convenient carrying. The price is $4.50, and the fuel bricquettes sell for 50 cents per dozen.

Clark Heater—A carbon-burning foot warmer, is manufactured by the Chicago Flexible Shaft Co., Chicago, Ill. Briquettes of specially prepared coal which last from 12 to 16 hours are used. The heaters are miniature metal stoves. Each consists of a strongly reinforced oval or triangular metal case, solidly riveted. This is lined with asbestos and then covered with a carpet. A sliding metal drawer held in place by a strong spring contains the fuel. The heat is regulated by a damper in the front. The prices of the heaters vary from $1.75 to $10. A dozen bricks sell for 75 cents.

Lytle Auto Heater—The installation of the exhaust tonneau heater made by the Lytle Auto Heater Co., Memphis, Tenn., is shown in Fig. 4. A flexible steel tube 1 inch in diameter taps the exhaust pipe just before entering the muffler, and by-passes the gas through the passages in the heater, and from thence to the open air. Air flows from under the car up around these heated passages and is warmed, thus supplying heat to the passengers.

K. P. Foot-Rest Heater—An exhaust heater which takes the place of the foot rest, is made by the K. P. Foot Rest Heater Motor Mart, Park Square, Boston.

Its construction is clearly shown, the heat being taken from the exhaust pipe, passed through the heater and finally into the air. The heat is regulated by a valve at one end. The device is finished in nickel, brass, or is oxidized, and it is furnished in lengths to fit any car. It sells for $25, including all parts for attaching.

American Auto Heater—Another exhaust heater which is placed in the floor of the car is made by the American Auto-Heater Co., 160 Fourteenth street, Buffalo, N. Y. It is made of aluminum and is 10 inches square by 3 inches deep. It sells for $28.50.

Radio Auto Heater—An exhaust heater of simple design is made by the Milwaukee Auto Specialty Co., 715 Chestnut street, Milwaukee, Wis. It is designed to be countersunk in the floor and consists of a hollow casting inclosed in a sheet metal box which measures 14.5

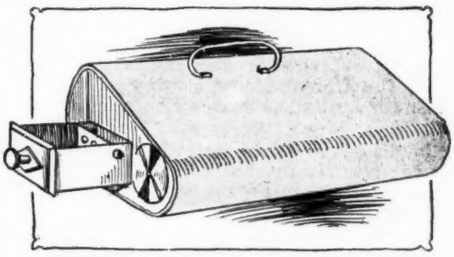

Fig. 3—Lehman foot warmer. It burns a special coal

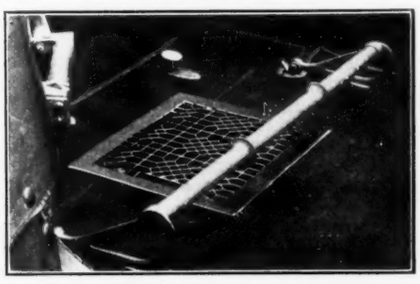

Fig. 4—Lytle Auto Heater

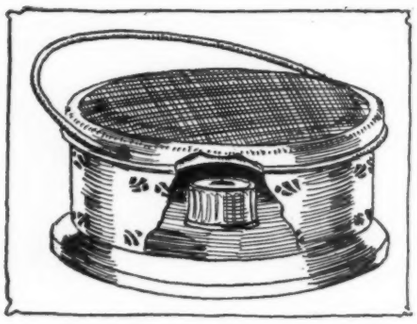

Fig. 5—Samson foot warmer

by 5 by 3 inches. The top of the radiator has a grilled, nickel-plated surface. The heat is regulated by a lever that actuates a three-way valve in the branch from the exhaust pipe.

Consolidated Heater—A small electric heater that does away with the necessity of draining the water from the radiator when the car is left in an unheated garage is being advanced by the Consolidated Car Heating Co., Singer Tower, New York City. This heater is placed on the top of the cylinders, the hood put down and the current switched on. Sufficient heat is generated to keep the mechanism inside the bonnet warm, prevent freezing and make starting easy. The necessary current may be obtained from an ordinary lamp socket and the cost of operating is 1 cent per hour. Alternating or direct current at 110 volts can be used. The price complete with attaching plug is $7.50.

Sure-Start Electric Vaporizer—The Sure-Start Electric Vaporizer, Fig. 6, is a device which supplies hot gasoline vapor to the intake manifold, thus insuring easy starting in the coldest weather. It is independent of the carbureter. A small switch on the dash controls both the supply of gasoline and the electric current, which requires a 6-volt battery. When the switch is turned on, the suction of the motor draws the fuel through the heated portion of the device, vaporizing the fuel. The gasoline feed may be either gravity or pressure.

It is stated that the device may be installed in less than an hour by any ordinary mechanic. The diagram of connections is clearly illustrated. The price of the device is $8, and it is made by the United Motor Equipment Co., 19 South La Salle street, Chicago, Ill.

Ieco Hand Warmers—To keep the hands of the driver warm in cold weather the electrically heated steering wheel grips shown in Fig. 7, have been brought out by the Interstate Electric Co., New Orleans, La. The grips are covered with leather, laced on. Under the leather of each grip are two copper plates between which is a coil of wire. Current for these grips may be supplied from the lighting system or, in the case of the Ford, from the magneto. It is stated that the grips only consume 18 watts.

Ieco Manifold Plug—This concern also offers a manifold plug, Fig. 8, which makes starting easy by warming up the charge as it passes to the cylinders. In addition it performs the ordinary functions of a primer by admitting auxiliary air to the manifold at high speeds. Gasoline may be introduced through it for starting, and kerosene or alcohol for removing carbon from the cylinders. It is made in 6 and 12-volt styles and sells for $5.

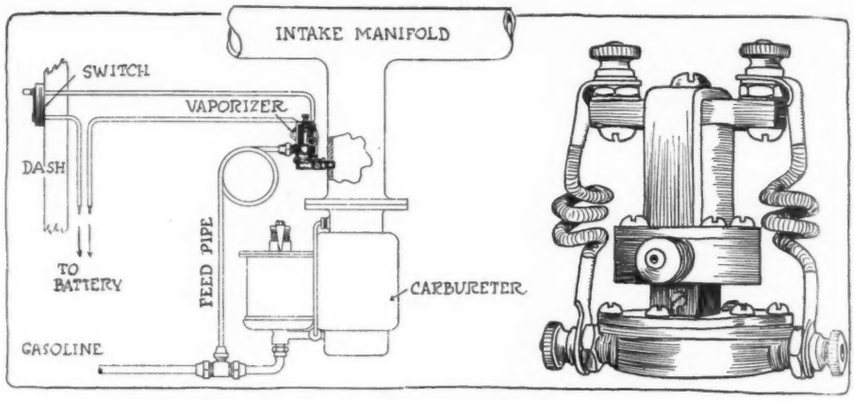

Fig. 6—Sure-start electric vaporizer. Left—Complete diagram showing connections. Right—vaporizer itself

Neverout Radiator Heater—With the idea of obviating the danger of a freeze-up and at the same time making starting easy, without installing a complete garage heating system, the Rose Mfg. Co., 910 Arch street, Philadelphia, Pa., has designed a radiator heater suitable for any car. It can be quickly attached to the cooling system when the car comes in at night. It consists of a small hot water heater, which is operated from the city gas or electric light mains, the device being furnished with either type of heater.

The heater warms the water, which passes up from it into the top of the radiator. The return connection to the heater is through a small rubber tube which may be attached to the drain cock at the bottom of the radiator. Circulation is automatic because the heated water, being lighter, rises, and the colder water rushes in to take its place.

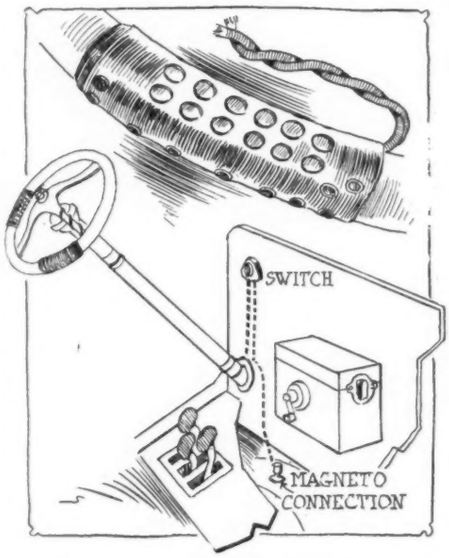

Fig. 7—Ieco hand warmers showing connections

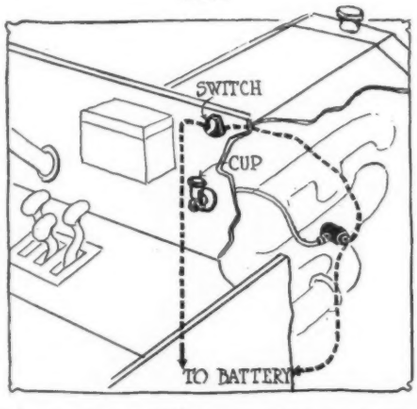

Fig. 8—Ieco manifold plug which heats the mixture electrically

Victory Primer Pump—A priming pump for introducing a vaporized fuel to the manifold for starting motors in cold weather or for priming motors that are hard to start is shown in Fig. 13. The pump consists of a cylinder .625 inch diameter by 5 inches length.

The pump is designed to be fastened to the dash or heel board by screws. A connection is made from the pump to the gasoline pipe line by brass tubing, and from the pump to the intake manifold.

It is put out by the Perkins Appliance Co., Springfield, Mass.

Warm Hand Wheel—A steering wheel, Fig. 9, with electrically heated grips is made by the Warm Hand Steering Wheel Corp., Poughkeepsie, N. Y. The wheel is slightly countersunk at each side so as to allow the tubing forming the heater to be wound flush with the balance of the rim. In the tubing is a heavily-insulated wire, one end of which runs to the current source while the other is grounded on one of the spider arms. The necessary electric energy may be obtained from a storage battery, lighting generator or Ford magneto.

The Warm Hand Wheel is installed on a Ford or any machine where the rim is screwed onto the spider by simply removing the four screws holding the old rim and putting on the new. On machines where the rim is integral with the spokes the whole wheel is furnished.

Chi-Fau-Co Primer—Fuel injection into the manifold is accomplished by means of a hand-operated plunger pump mounted horizontally on the dash in the primer, Fig. 11, made by the Chicago Faucet Co., 313 South Clinton street, Chicago, Ill. By reciprocating the pump plunger, the fuel is first sucked from the main fuel line and then forced into the manifold. The price of the device is $6 and when arranged to draw gasoline from a separate reservoir, the price complete is $6.50.

Injex Primer—The Reflex Ignition Co., 211 High avenue, Cleveland, O., has brought out the primer shown in Fig. 11 for $2.50.

By pulling a ring on the steering post

The AUTOMOBILE
THE CLASS JOURNAL COMPANY
231–241 W. 39th STREET NEW YORK CITY

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The surprising lowness of their retail price is due purely to the fact that they are made and sold in enormous quantities. We couldn't buy better springs, we couldn't buy better cages, we couldn't put better work into the manufacture of the C-C Shock Absorber if we sold it for $100 instead of $8.

You have hesitated about buying shock absorbers for your Ford in the past because the price was too high—all out of proportion to the price of your car. Yet you knew that you ought to have them. You realized that proper shock absorption meant more comfort to you, lessened up-keep expense due to decreased tire, fuel and repair bills and increased life to your car. Now all this is possible for only $8 and the C-C is the answer.

We have been successful manufacturers of metal specialties for over forty years. We have devoted five years of this to the shock absorption problem. We have supplied thousands of the world's highest priced and heaviest cars with the famous Coxajusto Shock Absorber. Therefore, we know that the C-C Shock Absorber is the proper Ford solution and do not hesitate to guarantee satisfaction or your money back to you. **These** are the only terms upon which we care to do business.

8.00 for set of four

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